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TRAVELS

IN

ENGLAND, SCOTLAND,

AND THE

HEBRIDES.

VOL. I.

TRAVELS

IN

ENGLAND, SCOTLAND,

AND THE

HEBRIDES;

UNDERTAKEN FOR THE PURPOSE OF EXAMINING THE STATE OF

THE ARTS, THE SCIENCES, NATURAL HISTORY AND MANNERS,

IN

GREAT BRITAIN:

in 1784

CONTAINING

Mineralogical Deſcriptions of the Country round Newcaſtle; of the Mountains of Derbyſhire; of the Environs of Edinburgh, Glaſgow, Perth, and St. Andrews; of Inverary, and other Parts of Argyleſhire; and of

THE CAVE OF FINGAL.

IN TWO VOLUMES WITH PLATES.

TRANSLATED FROM THE FRENCH OF

B. FAUJAS SAINT-FOND,

MEMBER OF THE NATIONAL INSTITUTE, AND PROFESSOR OF GEOLOGY IN THE MUSEUM OF NATURAL HISTORY AT PARIS.

VOL. I.

LONDON:

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1799.

ERRATA AND ADDENDA.

VOLUME I.

IN page 11, M. Faujas ſtates, that Klaproth in analyzing adamantine ſpar had found in it an earth peculiar to itſelf, and entirely *ſui generis*, which he called *corrindonian* earth: but the author obſerves in a note at the end of his work, that that able chymiſt has ſince diſcovered this earth to be merely of the argillaceous kind.

The following is the new analyſis of it:

Argillaceous earth —	84	
Quartzoſe earth —	6	50
Calx of iron — —	7	50
Loſt — —	2	
	100	

In the next page the author obſerves, that Mr. Haüy had given the name of *Leiaſtes* to the adamantine ſpar brought from China. That learned naturaliſt has, however, ſince abandoned that term.

Page 37, line 6, for *characteriſes* read *characterize*.

51, — 1 of the note, for *Depreaux* read *Deſpreaux*.

58, — 2, from the bottom, for *if ſhould* read *it ſhould*.

59, — 6, for *muſt* read *much*.

66, The author, in a note, mentions the number of the ſatellites which Mr. Herſchel had diſcovered moving round the Georgium Sidus, which was then only two: When M. Faujas printed his tour laſt year at Paris he was not acquainted with Mr. Herſchel's diſcovery of four more ſatellites.

Page 69, line 16, for *had* read *has*.
81, — 3, for *has* read *had*.
128, — 17, dele *with*.
129, — 1, for *ear* read *are*.
136, — 21, for *part* read *peſt*.
150, — 22, fupply *is* after *this*.
168, — 8, read of *a* man's head.
237, — 17, for *here* read *her*.
257, — 1, for *abound* read *abounded*.
303, — 10, for *began* read *begun*.
312, — 7, fupply *a* after *with*.
333, — 2, for *ar* read *argil*.
338, — 6, dele comma after *found*.
358, — 2 from the bottom of the note for *pininatis* read *pinnatis*.
359, — 6, for *Pluknet* read *Plunket*.

In the Firſt Volume the Printer has, by miſtake, left blanks before the names of ſeveral of the Members of the Royal Society; but as they are characters well known in the literary world, it is unneceſſary to point out here the manner in which their deſignations, &c. ought to be ſupplied.

PREFACE.

THE following Tour was prepared for the Preſs in the ſecond year of the revolution; but the troubles of that period rendered it neceſſary to delay its publication. The laws have, however, at length, reſumed their empire, and the ſciences will ſoon follow in their train.

Of the influence of the ſhock which our revolution gave to Europe, England has experienced her ſhare, and though the arts are not there reduced to the ſame diſtreſſed ſituation as in France, the war has impeded their progreſs, and they muſt languiſh until the reſtoration of peace. But happily for the Engliſh, they have loſt none of thoſe great men who adorn th eir country in the career of uſeful and elegant knowledge, while

while we have had the misfortune to ſee a great part of ours cruelly aſſaſſinated.

Theſe painful recollections have given to ſome of the notes that have been added to this work a melancholy, or perhaps, a peeviſh tone, which the reader, it is hoped, will excuſe.—The injuries done to myſelf I bury in oblivion, but the ſufferings of others I have not been able to forget.

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TRAVELS

THROUGH

ENGLAND AND SCOTLAND

TO THE

HEBRIDES.

CHAPTER I.

LONDON.

Sir Joſeph Banks.—Doctor Whitehurſt.—Cavallo.—Doctor Letſom.—Sheldon.—Royal Society.—Britiſh Muſeum, &c.

I DO not intend to entertain the reader, under this head, with obſervations on the extent, the beauty, or the immenſe population, of the city of London *: theſe have been fully treated of by others.

Natural

* Arthur Young, in his Travels in France, during the years 1787, 88, 89, and 90, a work full of new views and inſtructive facts reſpecting the population, com-

Natural hiſtory, the ſciences, the arts, and ſome objects of commercial economy, will more particularly engage my attention. I proceed to the ſubject.

Sir Joseph Banks.

The houſe of this celebrated traveller, who is Preſident of the Royal Society of London, is the rendezvous of thoſe who cultivate the ſciences; and foreigners are always received there with politeneſs and affability. They aſſemble every morning in one of the apartments of a numerous library, which conſiſts entirely of books on natural hiſtory, and is the completeſt of its kind in exiſtence. There all the journals and public papers, relative to the ſciences, are to be found; and there they communicate to each

merce, and agriculture of France, compared to that of England, in ſpeaking of the extent and population of the city of London, aſſerts, that London is ſo ſuperior to Paris, as to render all compariſon ridiculous; and that he believes, without any exaggeration, that this city alone is equal to Paris, Lyons, Bourdeaux, and Marſeilles, as might be proved from the accounts of the population, riches, and commerce, of all theſe places. However much I eſteem Arthur Young, I am not entirely of this opinion. London is, doubtleſs, more extenſive and populous than Paris; but not in that proportion.

other

other ſuch new diſcoveries, as they are informed of by their reſpective correſpondents, or which are tranſmitted by the learned foreigners who viſit London, and who are all admitted into this ſociety.

A friendly breakfaſt of tea or coffee ſupports that tone of eaſe and fraternity, which ought univerſally to prevail among men of ſcience and letters. They would, in general, become more ſociable, and more intimately allied, if accuſtomed to ſee each other frequently; eſpecially if they enjoyed, as in this city, a rallying point, preſenting the charms of mild ſociety in conjunction with thoſe pure pleaſures, which every thing connected with knowledge and inſtruction muſt always afford.

Sir Joſeph Banks has rendered important ſervices to the ſciences, by his diſtant voyages, undertaken for the purpoſe of diſcoveries; he benefits them daily by the collections which have been the reſult of thoſe voyages, particularly that of botany, the branch of natural hiſtory, in which he is moſt intereſted. His fortune alſo enables him to carry on an extenſive correſpondence with every part of the globe; and his kind

and communicative diſpoſition admits others to participate in the fruit of all his new diſcoveries.

This friend of the ſciences has hitherto publiſhed only the Collection of William Houſton *, containing a number of American plants, and Kaempfer's Collection of the Plants of Japan; but he has been long occupied in deſigning and engraving, by the ableſt artiſts, the plates of a ſuperb collection of the plants of the South Sea; a valuable work, which is expected with impatience, and which will be worthy of the reputation of its author.

Sir Joſeph Banks has made ſome precious acquiſitions in botany, and has thence become the guardian of ſeveral herbals executed by naturaliſts of great reputation. Had it not been for the attention and fortune of Sir Joſeph Banks, theſe collections of plants might have been diſperſed in diſtant quarters, or, perhaps, loſt by the negligence of heirs; whereas, united as they now are, in

* Reliquæ Houſtonianæ, ſeu Plantarum in America Meridionali, a Gulielmo Houſton, collectarum icones manu propria inciſæ, in bibliotheca Joſeph Banks Aſſervati. Londini, 1781, in 4to. fig.

one

one repoſitory, they are eaſily acceſſible to ſuch as incline to conſult them.

It is with this view that he purchaſed from Mr. Dick, miniſter of the goſpel at Bodligen in Switzerland, an herbal of the celebrated Haller, which comprizes the collections of plants made by the two brothers, Bauhins.

He has likewiſe acquired the plants of French Guiana, by Fuſee Aublet, the herbal of Jacquin, and ſeveral others formed by thoſe naturaliſts who have illuſtrated the botanical ſcience.

At the time I had the pleaſure of ſeeing Sir Joſeph, he received from China a package, in which there was a box, containing a lapideous matter, reduced to powder, ſuch as lapidaries employ in cutting and grinding hard ſtones, of the nature of rock-cryſtal, which the Chineſe make uſe of as ornaments in their dreſs and furniture. The ſame box incloſed a ſmall bag, containing ſome fragments of the ſtone of which this powder is made.

Europeans, in general, are acquainted only with two ſubſtances fit for ſawing and poliſhing hard ſtones—the powder of diamond, for cutting the diamond itſelf, and the other

finer gems; and that of emery, for jaſpers, agates, rock-cryſtals, &c.

Several years before the tranſmitting of that parcel, Doctor Lind, during a ſhort ſtay at Canton, employed himſelf in enquiries reſpecting the Chineſe arts; and he ſpared neither pains nor expence to obtain information on that ſubject, notwithſtanding the difficulties which he had to ſurmount.

He brought away with him ſome of the ſame powder, and one of the bows uſed by the lapidaries of China. It differs from that employed by Europeans, in having its ſtring made of double wire, that is, of two pieces of wire intertwiſted; whereas ours conſiſts of ſingle wire only. The Chineſe method deſerves to be made trial of by our artiſts. Doctor Lind did not neglect to procure ſome ſpecimens of the ſtone which ſupplies the powder for cutting; and it ſo happened, that almoſt all the fragments which he obtained, were cryſtalized. The largeſt of theſe cryſtals was ſent by Doctor Lind, in 1782, to Doctor Solander, who accompanied Sir Joſeph Banks in his voyage round the world. This celebrated naturaliſt died a ſhort time afterwards; and Mr. Wolfe, an able

able chymiſt, who purchaſed it at the ſale of Solander's effects, very obligingly made me a preſent of it at Paris, in the year 1783, where I then had the pleaſure of ſeeing him*. This is the ſame cryſtal which I lent to Mr. Briſon to aſcertain its ſpecific gravity, and which he has mentioned in his work on the Specific Gravity of Stones and Minerals.

It was by following the directions of Doctor Lind, that Sir Joſeph Banks endeavoured to procure the powder and ſpecimens of the ſtone from China, and that he ſucceeded in getting home the box, containing ſeveral pieces of it. Sir Joſeph offered me my choice of ſuch as ſtruck my fancy, and gave me a ſufficient quantity of the powder to enable me to make various experiments with it at Paris.

What attracted me moſt in the choice which Sir Joſeph allowed me, were ſome pieces ſtill adhering to portions of the ſtones in which this *adamantine ſpar* (as Doctor Lind calls it) is found. By their means, indeed, I was able to determine the nature of the compound ſubſtance that contains

* I gave this fine cryſtal to the national muſeum of natural hiſtory at Paris.

this ſtone, which, at firſt view, and from its lamellated contexture, reſembles a felt ſpar. I think it is beyond doubt, that this ſubſtance is a ſpecies of granite, in which it exiſts in the form of cryſtals, of a greater or ſmaller ſize, and more or leſs perfect. Theſe cryſtals are opaque, of a greeniſh-brown, and ſometimes of a greyiſh-white, colour, and they attract the magnet. They ought, therefore, to be ſought for in granite rocks, where it is probable they may be found; and, conſidering their uſefulneſs in the art of cutting hard ſtones, it would be a deſirable thing to diſcover them in the granites of France; we might then diſpenſe with uſing emery, which we bring from abroad *.

Doctor

* The following is a liſt of the ſpecimens which I ſelected from thoſe ſent to Sir Joſeph Banks, and which I gave to the muſeum of natural hiſtory at Paris, together with the large cryſtal preſented to me by Mr. Woulf.

1. Adamantine ſpar, of a brown colour, with rhomboidal truncatures in ſome parts.

2. Idem, adhering to lamellated mica, of a bright ſilver colour.

3. Idem, with a gloſſy black mica.

4. Idem, with greeniſh felt ſpar, black mica, and ſome ſpots of black ſchorl.

5. Adamantine ſpar, adhering to a greeniſh ſteatites, hard but ſmooth to the touch, and yielding an unctuous powder.

6. Idem,

Doctor Lind gave the Chineſe ſtone the name of *adamantine ſpar*, becauſe its lamellated

6. Idem, with white ſteatites, ſoft and having a ſmall mixture of mica.

7. With roſecoloured felt ſpar.

8. With ferruginous pyrites of a cubical form.

9. Cryſtal, mixed with adamantine ſpar, having on one of its ſides an impreſſion of a cubical pyrites.

10. Adamantine ſpar, in large irregular particles, adhering to like irregular particles of a reddiſh coloured quartz, and iron ſcattered in ſmall laminæ.

It cannot be any longer doubtful, that the adamantine ſpar exiſts in a compound ſubſtance. Lametherie mentions the adamantine ſpar in his notes on the ſciagraphy of Bergmann, p. 271, vol. 1, and, in imitation of Klaproth, gives it the name of corrindon. This learned and eſteemed friend, who ſeeks for truth only in all his enquiries, will not be diſpleaſed that I ſhould correct a trifling error which he has committed on the ſubject of this ſtone, where he ſays, in ſpeaking of its hardneſs, "that it equals only that of the "rock-cryſtal at moſt, for rock-cryſtal cuts it ſooner than it "cuts the cryſtal; its hardneſs may, therefore, be conſi-"dered as that of eleven to cryſtal." The following is a deciſive anſwer upon that ſubject: it is a detailed account of the experiments which I cauſed the ſon of M. Fontaine, one of the ableſt lapidaries in Paris, to make in the preſence of M. Hoppe, a German, who is deeply veried in the knowledge of precious ſtones. This ſubject is of ſufficient importance, from its novelty and utility, to juſtify my introducing in this place the reſult of theſe experiments.

"M. Faujas (Saint Fond) having ſent to M. Hoppe a "certain quantity of adamantine ſpar, to make compara-"tive trials of it with emery, the latter applied for that "purpoſe to M. Fontaine the ſon, whoſe talents are well "known

lated texture, its cryſtallization, and its appearance on being broken, ſeemed to claſs it among the *ſpars*.

The generic term *ſpar*, which we have

" known to every *amateur*, and who agreed, in the moſt " obliging manner, to ſatisfy the wiſhes of M. Faujas.

" The principal operations of the lapidary on precious " ſtones being to cut, to drill, and to ſhape on the wheel, M. " Fontaine employed the adamantine ſpar inſtead of emery " in all theſe operations, and, that he might obtain more " certain reſults, with inſtruments which had not been in " uſe before.

" Lapidaries cut and drill, in general, with powder of " diamond; to this the adamantine ſpar was much inferior, " but its effect was pretty conſpicuous, and ſuperior to " that of the enemy. M. Fontaine compared it to that " which the powder of ruby, ſapphire, or oriental topaz, " might produce.

" He then employed the powder of adamantine ſpar in " grinding and ſhaping on the wheel; and its effect ſur- " paſſed, in a degree beyond all expectation, that of the " other ſubſtance. The reſult of a great number of ex- " periments was, that the lapidary's wheel retains very well " the adamantine ſpar, that it requires only a fourth part " of what would be neceſſary of emery to render it perfectly " fit for grinding, and that one-half of the time is ſaved in " the operation. It may be proper to add, that the ada- " mantine ſpar prepares ſtones better for receiving a poliſh " than emery, becauſe the firſt produces a finer grain. " M. Hoppe having been preſent at all theſe operations, " took the above minute of the reſult of the comparative " experiments, and ſigns it with M. Fontaine,

" HOPPE.

" *Paris, May* 30, 1789. Fontaine the ſon, lapidary."

from

from the Germans, our firſt maſters in mineralogy, though inſignificant of itſelf, ought not, however, to be rejected, as the partizans of the new nomenclatures would perſuade us. On the contrary, it is becauſe we perceive no particular meaning in the root of that term that it ſhould be conſidered as a good one, when uſed in conjunction with an epithet; as, for example, *calcareous* ſpar, *ponderous* ſpar, *cubic* or *phoſphoric* ſpar.

Klaproth, who has analyſed the adamantine ſpar like an able chymiſt, has given it, for what reaſon I know not, the name of corrindon; and having diſcovered in that ſtone an earth peculiar to it, and entirely *ſui generis*, united with quartz, iron and nickel, he has thought fit to call it the *corrindonian* earth. If the word *corrindon* were Chineſe, I ſhould be the firſt to adopt it, and to adviſe naturaliſts to preſerve it, were it only to prove that the ſtone, and the uſe to which it is applied, have been tranſmitted to us by the Chineſe. But this word has ſo little reſemblance to the language of that people, that it muſt be preſumed to be of European manufacture.

This

This rage for coining new words has ſeduced M. Haüy, a very able naturaliſt, to create one of a compound kind, in imitation of ſome chymiſts, who have endeavoured to compreſs the principles of ſcience into its terms. He has, accordingly, called the adamantine ſpar *leiaſtes*, ſignifiying *lævigator* (poliſher), on account of the uſe, ſays he, to which it is applied, of poliſhing ſtones. But M. Haüy ſhould have conſidered, before he had formed a name taken from the properties of the thing itſelf, that the powder of adamantine ſpar is employed in cutting and ſawing ſtones, and not in poliſhing them. It is to the *putty* and the *ruddle* of England, which are deſtined to give them their poliſh and luſtre, that the name of *leiaſtes* would be moſt applicable. Let us, then, preſerve to this ſtone that of *adamantine ſpar*, however imperfect it may be, until we have aſcertained the name which it bears in China. In the mean time it will continue to be known, that Doctor Lind was the firſt who made us acquainted with it, and with its uſe among a people whoſe high antiquity and induſtrious application have given birth to a number of arts and proceſſes, which might be

be eaſily proved to be ſtill unknown to Europeans.

The reader will, I hope, excuſe the details into which I have entered reſpecting this ſtone: as it is an object ſtill new in natural hiſtory, as it may be of advantage to the art of the lapidary, and as it is preſumable that adamantine ſpar does not exiſt excluſively in the granites, or among the porphyries of China, I conceived that theſe conſiderations merited the attention of men of ſcience*.

The package ſent to Sir Joſeph Banks contained another object not leſs worthy of attention, as it intereſts a more numerous claſs of men—that of thoſe who are engaged in agriculture: it was a quantity of the ſeed of a ſpecies of hemp of a ſuperior quality to that cultivated in Europe.

In the year 1781, M. Elliot, who reſided

* It would be too long, and rather miſplaced, to mention here the different analyſes which have been made of this ſtone in France and Germany. M. de Bournon thought that he perceived ſome traces of it in a granite brought from Foret, on the coaſt of Montbriſon; and others conceived that they had made a like diſcovery in other quarters. I intend, as ſoon as my avocations will permit, to inveſtigate this ſubject completely in a ſeparate eſſay.

ſome

ſome time at Canton, gave Mr. Fitzgerald from thirty to forty grains of this hemp ſeed. It was not ſown until the 4th of June, which was about a month too late; but, notwithſtanding this circumſtance, and the dryneſs of that ſeaſon, the greater number of the plants roſe to the height of fourteen feet, and the ſtems of ſeveral were ſo large, as to meaſure ſeven Engliſh inches in circumference.

Theſe promiſing plants bloſſomed; but on the approach of cold weather, they periſhed without yielding any ſeed. "There "are," ſays Mr. Fitzgerald, "from thirty "to forty lateral branches on a plant; they "were ſet off in pairs, one on each ſide "of the ſtem, pointing horizontally; the "others, at about five or ſix inches diſtance "from them, pointing in different direc-"tions, and ſo on to the top; the bottom "branches of ſome meaſuring more than "five feet, the others decreaſing gradu-"ally in length towards the top, ſo as to "form a beautiful cone when in flower."

After ſteeping them in the ordinary manner, he ſays, that "on trying whether the "hemp could be eaſily ſeparated from the "woody part, I was agreeably ſurpriſed to "find,

" find, that on peeling a few inches longi-
" tudinally from the root, the whole rind,
" from the bottom to the top, not only of
" the ſtem, but alſo of all the lateral
" branches, ſtripped off clearly, without
" breaking any one of them: the tough-
" neſs of the hemp ſeemed to be extraor-
" dinary.——

" The rough hemp that has been peeled
" from the thirty-two plants, when tho-
" roughly dried, weighed three pounds and a
" quarter; but I do not think it had come to
" full maturity, though I can hardly doubt
" but the plants would have come to per-
" fection, if the ſeed had been ſown in the
" proper ſeaſon. The ſummer was re-
" markably dry, notwithſtanding which,
" although the ſituation they were placed
" in was very warm, and the ground not
" rich, I found, on meaſuring the plants at
" the different times, that they had grown
" nearly eleven inches *per* week."

Such is the ſubſtance of the paper communicated by Mr. Fitzgerald to Sir Joſeph Banks, which was read in the Royal Society of London, on the 17th of January, 1782, and printed among the philoſophical tranſ-

actions

actions of that year. I conceived that my readers would peruſe, with ſome intereſt, the hiſtory and reſult of the firſt experiment, though an incomplete one, which was made in Europe, on the hemp of China.

The deſire of acquiring to England an object ſo important for her navy, which conſtitutes her power, engaged the attention of the government, and of thoſe who wiſhed to enrich agriculture with this new production. It was known that the exportation of this ſeed was ſeverely prohibited in China. This prohibition, however, ſerved only as a freſh ſtimulus to zeal and emulation; and, on the firſt return from the voyage to China, a veſſel brought home about a pound of it, concealed in the box of natural hiſtory, addreſſed to Sir Joſeph Banks, which contained the adamantine ſpar, and other curious objects. The Preſident of the Royal Society was pleaſed to divide two ounces between Brouſſonet, who was then London, and myſelf, in order to make trial of it in France, particularly in the ſouthern departments, where both of us had eſtates. There was reaſon to hope that the ſeed would come to maturity in that climate, and that a ſecond

ſupply

ſupply might be got there, in caſe it ſhould not ſucceed in England. We received this valuable preſent with ſuitable acknowledgments; and I reſolved, on my return to Paris, to diſtribute ſome of it to able cultivators, and to reſerve the remainder for the the ſouth of France *.

WHITE-

* On my return to Paris, my firſt buſineſs was to give ſome grains to M. de Maleſherbes, M. de Roſambo, his ſon-in-law, M. de Trudaine the elder, M. Boutin, M. de Lavoiſier, M. Hell, for Alſace, Varenne de Feniſle, for Breſſe, M. Bouffon, for his eſtate of Montbard, in Burgundy, M. Thoin, for the botanical garden of Paris, and to M. Moral, phyſician, at Montelimar, who employs himſelf in agricultural purſuits. I reſerved about fifty grains for the ſubſequent year, intending myſelf to direct the ſowing of it, and to attend to its progreſs in the department of Drôme.

The hemp of China ſucceeded every where, even beyond expectation. That in the botanical garden of Paris was viſited as a curioſity; in the month of Auguſt it was fourteen feet high, and from fifteen to ſixteen in September. M. Hell wrote to me, from Alſace, that the ſtems of the twenty grains which he had ſown, were ſeventeen feet high on the 20th of September, and that their lateral branches were ſo vigorous, and occupied ſo much ſpace, that all the plants ſeemed rather trees than annual vegetables. This was the caſe alſo at Maleſherbes, Montigny, in Burgundy, Breſſe, and the other places. Every where male and female plants, of a promiſing bloſſom, made their appearance; but from Bourg to Paris, from Paris to the bailiwick of Landſer, in Alſace, not one of them yielded

WHITEHURST.

Benjamin Franklin had the goodneſs to give me a letter of recommendation to his old

good ſeed; the cold having prevented them from ripening. I was alſo informed, that all that had been ſown in England had the ſame fate. This ſpecies of hemp was every where found ſuperior to the common ſort, in ſtrength, in its ſilky texture, and in the length of its fibres. M. Thoin ventured to raiſe a few plants in turf, for the purpoſe of being put into pots, and placed in a green-houſe; ſo anxious was he to prevent this gigantic hemp from being loſt. The ſeed acquired a certain degree of maturity; it was not very vigorous, but it was capable of reproduction. I had ſome hopes from the other places where it had been tried, and I particularly looked for an account of what had been ſown in the vicinity of Montelimar. I learned, towards the end of September, that it had perfectly ſucceeded; that the dryneſs of the ſeaſon prevented it from growing ſo high as it did elſewhere; but that the ſeed had acquired the proper ripeneſs, and that more than a pound of it had been gathered. I obtained the ſame ſucceſs the following year from that which I kept in reſerve, and which I ſowed in the department of Drôme; the plants roſe to the height of twelve feet. I have hitherto continued this branch of cultivation with much ſucceſs, and it is evident that the hemp of China produces excellent ſeed in the ſouth of France. I have already given quantities of it to ſeveral perſons at Paris, and other places. It is of very great importance to avoid ſowing it near the common hemp. I wait for peace to repay my obligation to the Engliſh; for it is no more than juſt to return that which they have ſo generouſly lent us. I ſhould have publiſhed a long time ago the reſult of the experiments which I made myſelf, and thoſe of the different perſons to whom I had given part of the ſeed; but

old and eſtimable friend Whitehurſt, who has illuſtrated, in the moſt ample detail, the wonderful and ſingular ſtructure of the mountains of Derbyſhire, in a work entitled "*Inquiry into the original State and Forma-*" *tion of the Earth*, &c. by John White-" hurſt. London, 1778." In 4to. fig. 1 vol.

He was a native of Derbyſhire, and reſided a long time in the principal town of that county. His views and his meditations were thus directed to the face of a country truly extraordinary, and intereſting to naturaliſts.

Whitehurſt formed himſelf at an epoch when this ſcience was not far advanced. But if he has committed errors (and who is entirely free from them?) they are owing, not ſo much to the uncertain ſtate of mineralogy at that period, as to a ſort of religious awe and reſtraint which often fettered the pro-

but I have been prevented, I muſt confeſs, by the melancholy remembrance, which reminded me, that of eleven perſons to whom I gave ſome of the ſeed from China, and who, with an enthuſiaſm for the public intereſt, devoted their whole attention to its cultivation, eight have been dragged to the ſcaffold, without reſpect for names ſignalized by virtue and talents. Bouffon was dead—they took his ſon—he was unrelentingly aſſaſſinated.....

greſs of men of genius, and compelled them to trace immediate connexions between the multiplied revolutions of the globe, and the oriental coſmogony, delivered in the books of Moſes.

Whitehurſt had, many years before, fixed his reſidence in London, where he had it more in his power to proſecute his ſtudies, and to cultivate the ſociety of men of learning. This venerable old man was very tenacious of a diſcovery which he thought he had made in Derbyſhire, of a number of currents of baſaltic lava croſſing in various directions banks of calcareous ſtone, which they ſeemed, in many caſes, to have moved from their original poſition. The whole of the deſcriptive part of his book is excellent, and remarkably accurate.

" You have," ſaid he to me, " ſeen " ſeveral volcaniſed countries; you have " made the different ſubſtances, acted on " by ſubterraneous fire, your particular " ſtudy. I have not been able, from par- " ticular circumſtances, to travel out of " England, and to ſee volcanos in action; " but I conceived that I diſcovered in the " mountains of Derbyſhire traces of ſubter-

" raneous

" raneous combuſtion ſo evident, that I " thought myſelf capable of building on " that baſis a ſyſtem relative to the ancient " ſtate of the earth. I am anxious to have " my obſervations confirmed or rejected by " you.

" Were it not for a ſick female relation " in this place, who requires all my atten- " tion, I ſhould quit every other employ- " ment to accompany you. I feel a great " privation in loſing this opportunity; but " I will requeſt you to be the bearer of a " letter for a phyſician at the mineral wells " of Buxton, who is a man of general in- " formation, and well acquainted with the " places deſcribed in my book."

Manners of this affable complexion are calculated to render the ſciences attractive; and, when one has the happineſs to meet with ſuch men, to procure eſteem for thoſe who cultivate them.

I found a remarkable reſemblance between Mr. Whitehurſt and his friend, Benjamin Franklin. His good-nature, his frankneſs, his admirable ſimplicity of manners, and mild philanthropy, engaged my attachment, and I viſited him frequently. He had the

goodneſs to introduce me to the acquaintance of ſeveral men of ſcience, and to conduct me to the houſes of the ableſt artiſts of London, with whom he was particularly intimate, and who often came to conſult him. He carried his attention ſo far, as to divide with me a part of the minerals and foſſils which he had collected, and on which he ſupported his ſyſtem. His cabinet was not very conſiderable, his collection being confined to the productions of Derbyſhire; but that aſſemblage of objects, proper to form the mineralogical deſcription of a country, will always preſent an intereſting ſpectacle to the ſcientific traveller.

I promiſed Mr. Whitehurſt, that I ſhould direct my particular attention to the mountains which he had deſcribed. He ſaid, I ſhould oblige him by writing to him from Buxton or Matlock, as ſoon as I had viſited that part of the country, and telling him, without any reſerve, what I thought of the toadſtone, and the other ſtones which he regarded as volcanic. All the ſpecimens which I ſaw at his houſe convinced me, that he had fallen into the ſame error with Lammanon, who, in the Alps of Champſaur, miſ-

took

took *trapps* for pieces of lava; but I wiſhed to ſee the places where they had been collected, before I ſhould expreſs my opinion on the ſubject. I acted in the ſame manner towards my induſtrious and adventurous friend Lammanon, who was convinced of his error a little before he ſet out on the voyage round the world with La Pérouſe*, of

* Lammanon, who had great talents and a ſtrong attachment to natural hiſtory, was ſo convinced of the exiſtence of an extinguiſhed volcano, which he imagined he had diſcovered in the mountain of *Droveire*, one of the high Alps of Champſaur, in Dauphiny, that he made a drawing of the crater, the currents of lava, in a word, the complete topographical plan of theſe ſuppoſed remains of a ſubterraneous fire in the Alps; where there exiſts not a ſingle trace of a volcano. He tranſmitted to me from Turin, where he then was, the manuſcript of the paper which he compoſed on this ſubject; and requeſted, in his letter, to know my opinion reſpecting the diſcovery. He ſent to me, at the ſame time, the collection of the different ſubſtances which bore, according to him, the moſt evident marks of the action of volcanic fire. I had viſited that mountain, in 1776, in company with the botaniſt Liotard, and I was already in poſſeſſion of a collection of the ſtones which are found there, and which, at firſt ſight, appear to reſemble lava. I anſwered Lammanon's paper, article by article, and traced a parallel between theſe ſtones and the *trapps* of Sweden, of which I had a good collection. Lammanon, in his turn, refuted my objections in a very ingenious manner; and perſiſting in his opinion, on his return to Paris, printed at Euchet's, bookſeller, Serpent-

of whoſe unhappy fate he was a fellow-ſufferer.

Cavallo.

Tiberius Cavallo is a native of Naples, but has been ſettled upwards of twenty years in London; his chief occupation is natural philoſophy, in which he is profoundly ſkilled: he poſſeſſes much information, and diſplays ſingular dexterity in performing the moſt delicate experiments; he has carried electrometers to a degree of perfection, which

Hotel, Serpent-ſtreet, his paper, my letter, and his anſwer, with a plan of the places. This work was about to be publiſhed in 1784, when ſome learned Swediſh mineralogiſts, to whom he communicated it, together with his collection, aſſured him that all thoſe ſubſtances were varieties of *trapps*, abſolutely ſimilar to thoſe of their country. Lammanon, who ſought only for truth, acknowledged his error: he did more; he ſuppreſſed and deſtroyed the whole impreſſion of his book, excepting twelve copies, to all of which he annexed a printed paper, containing an honourable confeſſion of his miſtake, and the name of the perſons to whom he gave each of them. He was pleaſed to include me in the diſtribution. This book is a great rarity, as there are only twelve copies in exiſtence, or more properly eleven, ſince the death of the author, who carried one with him on his voyage. The title of it is "*Mémoire Litho-Geologique ſur la Vallée de Champſaur et* "*la Montagne de Droveire, dans le Haut-Dauphiné, par* "*le Chevalier de Lammanon. Paris*, 1784, 8°. *avec une* "*carte.*"

renders

renders them ſenſible to quantities of the electrical fluid totally unapparent by ordinary inſtruments. I ſaw at his houſe thermometers, upon which the ſlighteſt change in the temperature of the air acted in a very remarkable manner, and by means of which he obtained diviſions and graduations which had never been reached before. The tubes are extremely ſlender, and of a perfect bore, and the mercury is brought to the utmoſt degree of purity.

Cavallo has contributed greatly to that high degree of accuracy and perfection to which philoſophical inſtruments have been carried in England. I muſt alſo do juſtice to the Engliſh artiſts; they enter upon their profeſſion with much preliminary knowledge, reſulting from a good education, which does honour to a country, where the majority of the people are in a condition to eſtimate the merits of able artiſts, and to put an adequate value on the productions which come from their hands.

Cavallo was, at one time, much occupied with aeroſtatic globes. He has tranſlated into Engliſh, with notes and commentaries, all that has been written in France on that aſtoniſhing

aſtoniſhing diſcovery, of which the progreſs has been interrupted only by the great expences requiſite for experiments on a large ſcale; reſpecting which, however, we can never arrive at any beneficial and ſatisfactory reſults, without operating with vaſt machines, and employing the moſt extenſive means. But the principle is known; and it is to be hoped that, ſooner or later, it will be proceeded upon, and that ſome real advantage will be derived from a diſcovery, the value of which has not yet been generally enough felt*.

M. Cavallo ſhewed me a ſmall, but ſimple and ingenious, apparatus to procure ice

* The French uſed an aeroſtatic globe of taffety, with great advantage, at the battle of Fleurus. The inflammable air introduced into it was obtained from a decompoſition of water, by means of iron and a violent fire. It is the firſt time ſince men have fought againſt each other (and they have fought ever ſince they exiſted) that ſuch a military machine was ſeen in the preſence of an enemy: it was entruſted to the care of Cartelle, a man as intelligent as modeſt, who was captain of a company wholly deſtined to this ſervice, and formed of young ſoldiers full of zeal and addreſs. It was an agreeable ſight to ſee them conduct, raiſe, lower, and manœuvre, in every direction, this moving obſervatory, which enabled the general-in-chief to contemplate, at one view, and to a great diſtance, all the diſpoſitions and motions of the enemy.

quickly,

quickly, even in the hotteſt time of the dog-days, by the ſimple proceſs of evaporation. This inſtrument conſiſts of a ſmall cylindrical tube of very thin glaſs, about four or five lines in diameter, and two and a half or three inches in length, open at one end, and ſhut at the other.

There is introduced into this tube, till it reaches the bottom, a wire of any metal, but very ſlender, and of a ſpiral form; water is then poured into it to the height of ſeven or eight lines. The metallic wire is intended to draw out the ice, when it is formed. Things being in this ſtate of preparation, one of thoſe ſmall glaſs ſyringes with which children amuſe themſelves is taken; its extremity or beak ſhould be of the ſmalleſt capillary ſize, and it ſhould have no piſton. A quantity of well-rectified vitriolic æther is then poured into this kind of funnel, and the upper orifice is ſtopped with the thumb to prevent the evaporation, and to force the volatile liquor to eſcape by the ſmall end.

The æther ſoon trickles in very ſmall drops from this lengthened bill, which is held over the cylindrical tube, containing the water to be converted into ice. The

æther

æther is thus made to fall on the exterior ſurface of the tube, which is held in the left hand, and turned about with the fingers, till the whole is wetted with the æther flowing from the ſyringe held in the right hand.

This liquor evaporates almoſt inſtantaneouſly, and carries along with it the caloric of the water, which is ſeen, in a little time, to aſſume conſiſtence, and to paſs into a ſtate of congelation; the copper or iron wire is then withdrawn, and brings out with it a ſmall cylinder of ice.

Franklin had made ſome very curious obſervations on evaporation, and the effects which it produces, and of the uſeful application which might be made of it for medical, and even economical, purpoſes; he has written ſome very intereſting things upon this ſubject. The experiment of Cavallo is merely an application of this principle; but it is ſimple, and well adapted for philoſophical demonſtrations.

This experiment introduced a converſation on æther, in which I aſked this learned philoſopher a queſtion relative to an article in Macquer's Chymical Dictionary, which gave occaſion to ſeveral perſons to attack that

that celebrated chymiſt, on the ſubject of diſſolving elaſtic gum (or caoutchouc) in æther.

" It is certain," ſaid I, " that vitriolic " æther, as it is uſually prepared, does not " diſſolve elaſtic gum. But on the death of " Macquer, of whoſe chymical cabinet I " became the purchaſer, I found three ſmall " decanters, in one of which there was " elaſtic gum, perfectly diſſolved in æther; " of this, it would be eaſy to convince any " one. The other two contained ſome, " likewiſe, which appeared to be partly diſ- " ſolved; but it was precipitated to the " bottom in a ſtate a little thicker than tur- " pentine, and was found incapable of mix- " ing with the æther in the bottle. That " which contained the elaſtic gum in a ſtate " of perfect ſolution, had a label with this " inſcription, in the handwriting of Mac- " quer: ' *Elaſtic gum, diſſolved in æther, ſent* " *from London.*' I mentioned this, to be in- " formed whether you know any one in Lon- " don who has employed æther in diſſolving " *caoutchouc*, and what were the ingredients " uſed in addition to it, or the preparation " which it received."

" You

" You could not have addreſſed yourſelf," replied Cavallo, " to one able to procure " a more complete anſwer to your queſtions " than myſelf. We ſhall go, this morning, " to viſit the workſhops of ſome artiſts; and " as the perſon who diſcovered the proceſs " for diſſolving elaſtic gum is in our way, " we ſhall give him a call; your wiſhes " will thus be very ſoon gratified."

I accepted his offer, and in about an hour after we went to the houſe of Mr. Winch, an apothecary, who received us with a great deal of politeneſs, and who told me that he was the perſon who had addreſſed to Macquer, at Paris, a bottle of elaſtic gum, well diſſolved in æther, and that in a letter to the French chymiſt, he aſſured him that the æther did not contain the ſmalleſt mixture. Macquer, who found the elaſtic gum in perfect union with æther, of which the tranſparency was not in the leaſt altered, and who, on examining the æther, found it to be totally free from any extraneous ſubſtance, ſincerely believed that pure æther was the real ſolvent; and notwithſtanding his ſucceeding but imperfectly himſelf, though he employed the beſt æther, he probably perſuaded

ſuaded himſelf that what he uſed was ſtill inſufficiently rectified.

" I did not, indeed," ſaid Mr. Winch, " ſend him an account of the proceſs which " I uſed; but it is nevertheleſs true, that " the æther is unmixed, and that the whole " depends on a very ſimple preparation."

Cavallo, who is the friend of Mr. Winch, ſaid, that he intended to perform the experiment the next day, at his own houſe, and that I ſhould be a witneſs of it. It conſiſts in the following proceſs:—A pound of good vitriolic æther is taken, and put into a bottle, capable of containing about four pounds of any common liquid. On this æther there are poured two pounds of pure water; the bottle is then ſtopped, held with the mouth downwards, and ſtrongly ſhaken, in order to mix the two liquors. On diſcontinuing the ſhaking, the æther ſoon ſwims uppermoſt; the bottle is ſtill held in the ſame poſition, and cautiously opened, keeping the thumb on the mouth of it. The water is by this means eaſily let off, and collected in a veſſel below. The ſame operation is repeated two or three times, with new quantities of water, until the ſixteen ounces of æther are reduced to about

about five ounces. It is this purified remainder that is found to be the moſt perfect ſolvent of elaſtic gum, which is thrown into the æther, after being cut into ſmall pieces. It begins to ſwell in a very ſhort time; the æther penetrates it, and appears to act ſlowly on it at firſt; but at the end of five hours, or later, the liquor is ſaturated, and remains tranſparent. If there be a ſurplus of elaſtic gum, it ſubſides to the bottom; and, on being taken out of the bottle, may be moulded into any form, and will preſerve its elaſticity.

To ſhew how the part which is completely diſſolved is to be applied to uſe, I ſhall deſcribe the method employed by Cavallo to form a tube of elaſtic gum.

There is firſt prepared a ſmall cylinder of pipe clay, of the diameter and length of the intended tube. It is not neceſſary to bake it, but ſimply to let it dry.

The æther, ſaturated with gum, is poured into a caſe of glaſs, or tin, which ſhould be a little longer than the clay cylinder; this is filled up to the brim.

The operator then plunges the whole length of the clay pipe into the æther, withdraws it ſuddenly, lets it remain for an inſtant

in

in the air, replunges it anew, and repeats the operation in proportion to the intended thickneſs of the tube; for each immerſion and evaporation produces a ſmall coating.

This being done, the clay cylinder, covered, with elaſtic gum, is plunged into a veſſel of water; the mould of clay is there ſpeedily diſſolved, and the gum remains in the ſtate of a perfect tube.

This method of diſſolving and uſing elaſtic gum is ingenious; and in one reſpect reſembles that employed by the natives of America, who form all their works in elaſtic gum, on moulds of clay. It may be objected, that the proceſs with æther is too expenſive. The objection holds good with reſpect to ordinary purpoſes; but the elaſtic gum has been ſo uſefully employed in ſurgery and ſome other arts, that there are circumſtances, in which expence ought to be of no conſideration. The proceſs, alſo, for making æther is ſo ſimplified, that it is not half ſo dear as it was formerly *.

I ſhould

* I ſhould, doubtleſs, prefer, that we endeavoured to naturalize in Europe the uſeful tree, or rather trees (for it appears that there are ſeveral kinds of them), which yield the ſingular production of elaſtic gum. It ought inceſſantly

I ſhould not forget to mention, that the water uſed in purifying the æther ought to be preſerved, becauſe a part of the æther mixed with it may be recovered by diſtillation.

I ſaw Mr. Cavallo frequently; and it is impoſſible to be in his company without reaping inſtruction. He was pleaſed to make me a preſent of one of the electrometers which he has brought to ſuch a degree of perfection, and which were not then to be

ceſſantly to be recommended to the naturaliſts employed by government on voyages of diſcovery, to direct their attention principally to the ſending home plants and trees of well-aſcertained utility. It is wonderful, that the cinchona (Peruvian-bark-tree), that admirable ſpecific for a multitude of diſeaſes, ſhould ſtill be confined to parts of Peru, where the temperature is not very different from that of many places in the ſouth of France. I muſt do juſtice to the adminiſtration of the botanical garden of Paris; they have not neglected this object. They have intelligent botaniſts in America and other places, who have ſent home very uſeful articles; and the economical branch of botany begins to be attentively cultivated by them. It ought not to be omitted, that this garden furniſhed the firſt coffee-plant to America. Two plants of that ſhrub were carried out by Declieu, who deprived himſelf, during a long paſſage, of a portion of his allowance of water, to preſerve the only one which at laſt remained to him. It arrived, owing to his attention, in good condition at Martinique, where it produced that immenſe progeny which has ſupplied all the Antilles. The nation has a debt of gratitude to pay to the memory of this uſeful man.

found

found at the ſhops of the philoſophical inſtrument-makers. He likewiſe gave me, with the ſame obligingneſs, a beautiful cryſtal of adamantine ſpar, which he had from Doctor Lind *. I took the opportunity to repeat my grateful acknowledgments of his kindneſs.

Doctor Letsom.

This celebrated phyſician has a collection of birds, inſects, and minerals, ſome of which are very curious; but of all the objects that are to be ſeen and admired at his houſe, the moſt intereſting is, without contradiction, himſelf.

This friend of humanity, this virtuous quaker, was the firſt to give the example of emancipating the negroes from ſlavery, by ſetting at liberty all that were employed in his rich poſſeſſions in America.

He finds the moſt delightful recompence for this act of juſtice in the ſenſations of his own heart, and in the tender and filial attachment of thoſe whoſe chains he has broken. They have become more inſepara-

* I gave this cryſtal to the cabinet of natural hiſtory at Paris.

ble from him ſince they have had the liberty of leaving him when they pleaſe. Happy is the man who places his felicity in doing good to others! We love to meet with ſuch men. They conſole us for the injuſtice, and the cruelty of ſo large a portion of our ſpecies.

All the family of Doctor Letſom participate of his amiableneſs and candour; every perſon with whom he aſſociates is of the ſame deſcription.

After employing a part of the day in adminiſtering comfort to his numerous patients, he returns home to ſhare in the enjoyments of friendſhip, and aſſembles around him perſons whom he loves, and by whom he is beloved.

I ſupped one evening with him, when ſome of the moſt lovely women of London were of the party. It is true, they were neither powdered nor perfumed, and had not, like moſt ladies, heads full of feathers, or artificial flowers; but their beautiful hair floated with becoming gracefulneſs on handkerchiefs uncommonly white and fine. Their ſimple, but elegant, dreſs, was remarkable for the excellent quality of the ſtuffs which compoſed

compoſed it, and its only ornament was the charming countenances and unaffected graces of thoſe who wore it.

Every thing in this houſe correſponded with that neatneſs and exquiſite ſimplicity which characterizes the quakers. A young widow, of an elegant perſon, and highly-cultivated mind, was one of the company. Her agreeable vivacity formed a pleaſing contraſt with the mild and tranquil ſenſibility of the other ladies, all of whom, however, poſſeſſed information and talents.

We ſupped without napkins, a circumſtance which is not uncommon in many houſes in England; but the beſt kinds of beer, plain, though exquiſitely flavoured, meats, and the choiceſt vegetables, were ſerved up in proper veſſels, of the moſt elegant form. The cloth was removed at the deſert, and fruits, comfits, and other delicacies, with a variety of wines, in cryſtal decanters, were placed on a table of the fineſt mahogany. This is the luxury of the Engliſh. We drank more than once in champaign and claret, to the health of our fair companions, and they pledged us in madeira and conſtance. A lively, but de-

corous, gaiety, a frank and pleaſing ſimplicity, animated this ſcene.

Tea, punch, and other liquors, came in their turn. We ſhould have paſſed the whole night at table, had we yielded to the preſſing invitations of the doctor. But, notwithſtanding his ſolicitations, the party broke up at one o'clock. During the remainder of the night, I meditated how I ſhould become a quaker; for, if happineſs can be found anywhere on earth, it is among theſe worthy men.

John Sheldon.

There are good phyſicians in Paris, but there are more in London who excel in the practice of medicine. The uſeful art of curing, or correcting the diſeaſes and infirmities which afflict mankind, requires a preliminary education, ſo long and ſo laborious, and depends ſo much upon the moſt profound kind of knowledge, that we cannot ſet too high a value upon him who fills this honourable function with diſtinction.

The Engliſh are more wealthy than the French, and perhaps this is the reaſon why

they

they are oftener ſick. In London in particular, where neither the food nor the climate are ſo ſalubrious as in Paris, phyſicians find much more employment, and are better rewarded for their labour, than with us. This profeſſion is highly reſpected, and it is at the ſame time very lucrative.

The ſurgery of the French ſchool is the firſt in Europe; by the word ſchool I mean the admirable manner in which the French ſurgeons explain and practiſe all the branches of their profeſſion; in which they ſo trace and apply the innumerable ramifications of anatomy, as to enable them to proceed with confidence in the art of curing, and in performing operations which are often terrible to the feelings, but almoſt always certain and ſucceſsful in their effects. Thus pain is relieved by pain, and inſtruments of death are employed in giving life to man.

By what I have ſaid above, I am far from intending to inſinuate that there are not juſtly-celebrated ſurgeons in London, and other parts of the three kingdoms. I ſhall have occaſion to mention ſeveral of them.

I was particularly desirous of seeing those who had made comparative anatomy their study, a subject so intimately connected with natural history.

I had to regret the absence of Doctor Hunter, who was at this time in the country, but I often visited John Sheldon, and some other anatomists of merit. Mr. Sheldon has one of the finest anatomical cabinets in existence. He is known by some excellent publications, particularly a work on the lymphatic vessels, ornamented with magnificent engravings.

This learned anatomist, animated with the passion of prosecuting still farther his enquiries respecting the lymphatics, resolved to encounter the fatigues, and to brave the dangers, of the whale fishery, in order that he might have the opportunity of dissecting the very apparent vessels of these enormous animals.

One must have seen and been well acquainted with John Sheldon, to be able to appreciate his extraordinary passion for study, or the activitity of his mind, unceasingly animated by the vivacity or the fervour of his character. There was none

of

of the Engliſh gravity about him. I love to meet with ſuch exceptions; but I know that he who is by lively and vigorous conceptions elevated to great undertakings, who labours with ardour, and unites a variety of information to an aptitude and paſſionate deſire for knowing much, cannot have the ſame uniformity of character, nor act in the ſame ſyſtematic manner with common men.

Sheldon, whom I ſaw frequently, intereſted me the more, as he joined to a vivacity, which perſons of a colder character might think extravagant, the moſt eſtimable qualities.

The diſcovery of air balloons, excited his enthuſiaſm. He no ſooner learned what had been done at Paris on this ſubject, than he ſuſpended a part of his anatomical labours, to make calculations reſpecting the gravity of the atmoſphere. He afterwards directed his enquiries to the diſcovery of the moſt proper ſubſtance for making the covering of baloons, to improving the varniſh, and to the inventing of the moſt convenient apparatus for ſimplifying and perfecting theſe machines. He viſited all the ſhops and manufactories

manufactories of London, to gain information on theſe ſubjects. He told me that he intended to go to France ſoon, in order to pay his reſpects to Montgolfier, Pilatre and Charles; and to ſee the improvements they had made in the art of aeroſtation.

But his active mind did not permit him to wait ſo long before he carried his favourite deſign into execution, and, in concert with Major Gardiner, he conſtructed an aeroſtatic globe in Lord Foley's garden. This balloon was made of varniſhed linen, and was fifty-ſix feet in diameter. It was filled with air, rarified by fire. He informed me that he meant this merely as a trial, upon a ſmall ſcale, calculated to enable him to ſtudy this machine; but he was of opinion that experiments would be more ſatisfactory if they were made, as he hoped they one day would be, upon very large aeroſtatic globes.

The anatomical cabinet of Sheldon contains a great variety of curious preparations. I dedicated ſeveral mornings to viſiting it, and examining a number of valuable deſigns made by able artiſts; but nothing in this collection intereſted me ſo much as a kind

kind of mummy, which was very remarkable in two reſpects: firſt, on account of the ſubject itſelf, of which I ſhall ſoon ſpeak; ſecondly, with relation to the manner of the preparation, and the particular care with which it had been made. It occupied a diſtinguiſhed place in the chamber where this anatomiſt uſually ſlept; and he was particularly fond of this work.

I was introduced into a very handſome bed-room; a mahogany table of an oblong form, ſtood in the midſt of it, facing the bed.

The top of the table opened by a groove, and under a glaſs-frame I ſaw the body of a young woman, of nineteen or twenty, entirely naked. She had fine brown hair, and lay extended as on a bed.

The glaſs was lifted up, and Sheldon made me admire the flexibility of the arms, a kind of elaſticity in the boſom, and even in the cheeks, and the perfect preſervation of the other parts of the body. Even the ſkin partly retained its colour, though expoſed to the air.

It appeared to me, however, that the fleſhy parts were rather dry, and that there

was

was too great a tenſeneſs of the muſcles. This gave to the figure, though it ſtill poſſeſſed the remains of beauty, a meagre and feeble air, which conſiderably diminiſhed the delicacy of its traits.

Sheldon informed me that this was partly occaſioned by the long ſickneſs of which the young woman died.

He explained to me the manner in which this preparation had been made. He injected ſeveral parts of the body with ſtrong ſpirits of wine, ſaturated with camphire, and mixed with a ſmall quantity of turpentine.

The ſkin was prepared and tanned, as it were, with finely powdered alum, rubbed on with the hand. The inteſtines were taken out, and covered with a varniſh, compoſed of a mixture of camphire, and the common roſin. The ſame thing was done to all the internal parts of the body, which were afterwards paſſed over with alum.

Sheldon aſſured me, that pulverized camphire, mixed with roſin, formed an excellent compoſition for preſerving the fleſh, and other ſoft parts. After having placed all the viſcera thus prepared in the body, he

then

then injected the crural artery with a ſtrong ſolution of camphire, in rectified ſpirit.

Wiſhing afterwards to imitate the natural tint of the ſkin of the face, a coloured injection was puſhed through the carotides, to produce that effect.

In this ſtate of things the body was placed in the table of which I have ſpoken; but within a double caſe of timber. The firſt is made of Virginia cedar *(Juniperus Virginiana)*. The inner bottom was covered with calcined chalk, to the thickneſs of one inch, in order to abſorb all humidity. Upon this bed the body was extended. The box, or caſe, was then carefully ſhut up, to ſecure the body from the impreſſion of the external air.

The box was not opened until five years after the preparation was made. It was then obſerved to be in the ſame ſtate of preſervation in which it was firſt encloſed. No mark of decay appeared, and no inſect had introduced itſelf near the body. The box had been ſeveral times opened when I ſaw it; and though this mummy at that time ſtill poſſeſſed elaſticity in ſeveral parts,

it

it is to be ſuppoſed that the action of the air will at laſt completely wither it.

A ſentiment of curioſity made me aſk Sheldon, at the moment when he was cloſing up the table, who this young woman was, whoſe remains he had preſerved with ſo much care. He replied frankly, and without any heſitation, "It is a miſtreſs "whom I tenderly loved. I paid every "attention to her during a long ſickneſs, "and a ſhort time before her death, ſhe "requeſted that I ſhould make a mummy "of her body, and keep her beſide me.—I "have kept my word to her."

I was glad that Sheldon had not informed me of this circumſtance ſooner, for I confeſs I could not have avoided experiencing a diſagreeable feeling at ſeeing a lover coolly deſcribe the anatomical operations which he had made on the object of his moſt tender affection; on a charming young woman whom he had loſt, and whoſe diſfigured image could only excite in him the moſt painful recollections.

I can conceive that there might be a pleaſing conſolation, a ſort of veneration and religious

religious reſpect, which would extend itſelf beyond the limits of life, if we were, as in ancient Egypt, in the practice of preſerving the remains of our relations, friends, and all thoſe who are moſt dear to us; but who would, with his own hand, perform the diſguſting operations which muſt be neceſſary to preſerve the body of his friend? I avow I ſhould almoſt be tempted to act like the Egyptians, who ſtoned thoſe who executed this melancholy buſineſs.

But the learned Sheldon does not merit ſo ſevere a treatment. He is gentle and compaſſionate; and I certainly deceived myſelf, and was wrong in regarding this kind of courage on his part, as an act of cynicism: beſides, well-informed perſons in London, who were acquainted with this tranſaction, aſſured me that it required great ſtrength of mind in Sheldon, to overcome his ſenſibility. Let us quit, however, this diſmal ſubject, and proceed to deſcribe the dinner which I had with ſome of the members of the Royal Society.

THE

THE DINNER OF AN ACADEMIC CLUB.

ABOUT forty members of the Royal Society have been, for more than twenty-five years, in the habit of dining annually in one of the taverns of London. Each member has the right of bringing to this club two viſitors, whom he chooſes, among foreigners, or the friends of the Royal Society of his own acquaintance. The preſident may bring a greater number, and can ſelect whoever he pleaſes for gueſts.

We ſat down to table about five o'clock. Sir Joſeph Banks preſided, and filled the place of honour. No napkins were laid before us; indeed there were none uſed; the dinner was quite in the Engliſh ſtyle.

A member of the club, who is a clergyman (I believe it was the aſtronomer Maſkelyne), made a ſhort prayer, and bleſſed the company and the food. The diſhes were of the ſolid kind, ſuch as roaſt beef, boiled beef and mutton prepared in various manners, with abundance of potatoes and other vegetables, which each perſon ſeaſoned as he pleaſed with the different ſauces which were placed on the table.

The

The beef-ſteaks and the roaſt beef were at firſt ſufficiently drenched by large quantities of ſtrong beer, called porter: it was drank out of cylindrical pewter pots, which are, by ſome, thought preferable to glaſſes, perhaps becauſe they enable one to ſwallow a whole pint at a draught.

This prelude being finiſhed, the cloth was removed, and a handſome and well-poliſhed table was covered, as if it were by magic, with a number of fine cryſtal decanters, filled with the beſt port, madeira, and claret; this laſt is the wine of Bourdeaux. Several glaſſes were diſtributed to each perſon, and the libations commenced on a grand ſcale, in the midſt of different kinds of cheeſes, which, rolling in mahogany caſes from one end of the table to the other, provoked the thirſt of the drinkers.

To give more livelineſs to the ſcene, the preſident announced the health of the prince of Wales: this was his birth-day. We then drank to the elector palatine, who was that day to be admitted a member of the Royal Society. The ſame compliment was next paid to us foreigners, of whom there were five preſent.

The members of the club afterwards

ſaluted each other, one by one, with a glaſs of wine. According to this cuſtom, one muſt drink as many times as there are gueſts, for it would be thought a want of politeneſs in England to drink to the health of more perſons than one at a time.

A few bottles of champaign ſoon put all the company in good humour. The tea came next, with butter, marmalade, and all its uſual accompaniments: coffee followed, humbly yielding precedence to the tea, though it be the better of the two. In France, we commonly drink only one cup of good coffee after dinner; in England they drink five or ſix times that quantity of the moſt deteſtable kind.

Brandy, rum, and ſome other ſtrong liquors, cloſed this philoſophic banquet, which terminated at half paſt ſeven, as there was to be a meeting of the Royal Society at eight o'clock. Before we left the club-room, the names of all the gueſts were written on a large ſheet of paper, and each of us paid ſeven livres four ſols French money: this was not dear.

I repaired to the Society along with Sir Joſeph Banks, ——— Cavendiſh, Dr. Maſkelyne,

kelyne, ——— Aubert, and Sir —— Englefield; we were all pretty much enlivened, but our gaiety was decorous.

Doubtleſs, I ſhould not wiſh to partake of ſimilar dinners, if they were to be followed by ſettling the intereſts of a great nation, or diſcuſſing the beſt form of a government; ſuch a conduct would neither be wiſe nor prudent; but to meet, to celebrate the admiſſion of an elector palatine, who has, beſides, much merit, to a learned ſociety, is not a circumſtance from which any inconvenience can reſult *.

THE

* The great Corneille, Moliere, Depreaux, La Fontaine, and Racine, uſed to take a bottle now and then in a tavern; and they were neither the worſe friends, nor the worſe poets, for it. How much is it to be wiſhed that ſome men, who have had ſufficient influence in France to deſtroy the academies by loading them with calumnies, and power enough to re-eſtabliſh them by beſtowing on them their praiſes, inſtead of flying and abandoning, in the times of misfortune, their unhappy brethren, had ſought to aſſemble them in convivial, but modeſt, banquets, where their union might have been intimately cemented, and where they might have ſworn to defend, with courage and with the arm of genius, the ſacred rights of juſtice and violated humanity: then afflicted France, and indignant Europe, would not have had to regret thoſe illuſtrious and unfortunate victims, which have been delivered up to ferocious tigers; and we ſhould ſtill have counted, among

The Royal Society.

The room in which the meetings of this ſociety are held, is in the old palace of Somerſet-houſe: it appeared to me much too ſmall. It is not long ſince this part of the palace was rebuilt; but notwithſtanding the freſhneſs and elegance of the decorations, the room wants that noble and ſevere character which ought to diſtinguiſh a place conſecrated to the ſciences: it reſembles a concert-hall rather than a Lyceum; and the manner in which the ſeats are diſpoſed, tends to encreaſe this reſemblance.

The ſeats are only ſimple benches, with backs, ranged in parallel lines, and occupying the whole of the room. The preſident and the ſecretaries have alone diſtinguiſhed places. The former is ſeated in an elevated chair, of a coloſſal form. It is made of mahogany, and ſurmounted with an eſcutcheon, on which are painted the inſignia of the ſociety. Nothing can be in a more gothic or worſe taſte than this ornament.

The table, which is before the preſident's

the learned men who honour their country, Maleſherbes, Bailly, Lavoiſier, Condorcet, and many other philoſophers and artiſts, who have been cruelly butchered.

chair,

chair, is elevated, and covered, one cannot tell why, with an enormous cuſhion of crimſon velvet. Before this, there is a ſecond table, deſtined for the ſecretaries, upon which there lies a large mace of gilded wood, or metal. This is the ſymbol of all the royal inſtitutions.

The ſociety was aſſembled preciſely at eight o'clock. Sir Joſeph Banks preſided, and —— Blagden was one of the ſecretaries. The ſtrangers were placed near the members who introduced them; and, however little known they might be, every member behaved to them with the greateſt politeneſs and affability *.

The preſident firſt read the names of the ſtrangers admitted that night, and the names of the members who had preſented them. He afterwards propoſed the Elector Palantine as a candidate for a vacant place. The

* The detractors of the Engliſh character, have reproached them with behaving in a cold and ſurly manner to foreigners. What has been conſidered as coldneſs, is, perhaps, only a proper reſerve. Strangers were politely and honourably received in this learned ſociety, and placed by the ſide of the members with whom they were fraternally confounded. The ſciences, like the muſes, ſhould be regarded as ſiſters, and ought to know no diſtinction of country or of government.

elector was admitted with applauſes. When this buſineſs was finiſhed, the meeting broke up.

Some members whom I had the honour of knowing, engaged me to go next day to Greenwich, to ſee the Obſervatory, where a committee of the ſociety was to meet, by the order of the government, to examine the ſtate of the aſtronomical inſtruments: it is the practice to form committees of this kind annually; for in this country whatever is connected with naval affairs, becomes an object of general attention, and is never loſt ſight of for a moment.

After this viſit, there was to be a dinner in the country; and Herſchel, who was one of the committee, was expected to be there. I was to be introduced to this illuſtrious aſtronomer, and I had ſome hopes that he would not refuſe me the favour of ſeeing the large teleſcopes in his obſervatory in Windſor Foreſt.

THE OBSERVATORY OF GREENWICH.

This uſeful inſtitution, which is conſecrated to aſtronomical obſervations, is ſituated on a hill, about ſeven miles from London.

don. I went there in a coach, which arrived in about an hour and a half.

The obſervatory is built on the moſt elevated part of the hill; and it affords one of the fineſt views imaginable.

The Thames flows at your feet, lined up to London-bridge with deep rows of veſſels. Streamers waving in the air—ſhips under ſail, going up and down the river—an immenſe multitude of men of all nations on this floating city—the more remote maſts mingling with the ſteeples—the church of St. Paul, whoſe dome and fine proportion excite admiration even at this diſtance—Weſtminſter Abbey, with its towers and Gothic architecture—the column, called the Monument, riſing to the height of two hundred and two feet—all theſe grand and magnificient objects form a moſt enchanting picture, the true point of view for which is from the obſervatory of Greenwich.

The obſervatory is built of brick, in a ſtyle of the greateſt ſimplicity. Magnificence and reſearch are diſplayed in the inſide only in the perfection of the inſtruments, which nothing can exceed.

I found the committee aſſembled, and

Doctor Maſkelyne, the keeper of the obſervatory, had the goodneſs to ſhew me, in detail, the moſt remarkable objects in that rich collection.

The truly learned are eaſily diſtinguiſhed by their manners. Nothing can equal their complaiſance and affability; for the cultivation of the mind ſoftens the manners, as that of the earth renders its productions more delicate. The man of ſcience, or of literature, who ſhould appear proud, haughty, or ſelf-ſufficient, would be very diſagreeable; and whatever his pretenſions may be, he muſt always ſeem to the man of ſenſe an unſocial being, poſſeſſing only a mediocrity of talents. Great timidity, habits of retirement, and the importunities to which celebrated men are expoſed, may, indeed, give them a cold and reſerved air; but the difference is eaſily diſtinguiſhed.

Doctor Maſkelyne added to his other kindneſſes that of introducing me to Mr. William Herſchel, who invited me to ſee his obſervatory, and the large teleſcopes of his conſtruction, in the country. We appointed a day for this viſit.

The committee having finiſhed their buſi-

neſs,

neſs, we all aſſembled in a tavern, in the neighbourhood. There were about thirty perſons at table. The dinner was ſerved in the Engliſh manner, and ſeaſoned, according to cuſtom, with a preliminary benediction on the gueſts and the victuals. The repaſt was excellent, and the company were gay and extremely agreeable.

We roſe from the table about ſeven o'clock, not to depart, but to paſs into another room, where tea, coffee, and all their uſual accompaniments, were diſpoſed with much ſhow, upon a large table. The tea is always excellent in England; but nowhere do people drink worſe coffee. It would appear, that the Engliſh are little ſenſible of the delicious flavour of this agreeable liquor, which nature ſeems to have created to ſolace at once the body and the mind: it is not only grateful to the ſtomach, but reinvigorates the underſtanding when one is fatigued with too intenſe thinking. Voltaire, who was extremely fond of coffee, called it the *quinteſſence of the mind.*

Why then does the Engliſh government, for political and commercial reaſons, prevent the people from uſing coffee, which they might prepare according to their own taſte,

taſte, and compel them to purchaſe a kind of inferior quality, and bad flavour, from dealers who have it long in their poſſeſſion after it is burned? One would imagine that it has been purpoſely contrived to render this liquor diſguſting in a country where it is ſo neceſſary for removing melancholic humours—where the atmoſphere is covered with an almoſt continual gloom—and where, if we may believe the celebrated Fielding, there is more port wine drank in one year, than the whole kingdom of Portugal produces in three.

It would certainly be far better policy to ſubſtitute for tea, which is brought from China, the coffee which grows in the Engliſh colonies: ſuch a change might, perhaps, tend to diminiſh that alarming conſumption of wine which occaſions in this country ſo much inebriety, and ſo many diſeaſes.

I beg pardon of the reader for this digreſſion, which is ſomewhat foreign to my ſubject: but I was ſo diſguſted with the bad coffee which I found, even in the moſt opulent houſes of London, that, on account of my attachment to the better kind of that liquor, I could not avoid paying it this ſmall tribute of gratitude, or, if ſhould be called ſo, of epicuriſm.

CHAP.

CHAPTER II.

Sir Joſeph Banks's Country-houſe.—The Obſervatory of William Herſchel, near Windſor.—His large Teleſcopes.—Miſs Caroline Herſchell, his Siſter.

ON the 15th of Auguſt, I made a pleaſant excurſion to the country-houſe of Sir Joſeph Banks, about ten miles from London. I ſaw his gardens, and obſerved, in ſeveral inſtances, a cultivation and management which muſt intereſted me. I was ſhewn a beautiful bird, which had never before been brought alive to England; it was the green pigeon of the iſland of Nicobar: his plumage was of a deep green, and a brilliant luſtre. The livelineſs of his character was as ſtriking as that of his colour: he was bold, petulant, and had none of the gentle manners which belong to the family of the dove; but this fine bird is not the leſs intereſting, that it differs ſo much from every other ſpecies of the pigeon. It is of the ſize of

of an ordinary dove, but the body is longer. It is ſaid to be very delicious food*.

Sir Joſeph Banks informed me, that the ſeamen who had brought away ſeveral of theſe birds from the iſland of Nicobar, intending to ſell them in England, could not reſiſt the temptation of eating them during their voyage. This one had accidentally eſcaped from being devoured, and was the only one ſaved out of a conſiderable number.

It were to be wiſhed that they had left him a companion: this ſuperb ſpecies would, perhaps, have been propagated in Europe; at leaſt, the experiment might have been made.

At ſeven in the evening, after an elegant dinner and deſert, at which there was abundance of pine-apples, I took leave of Sir Joſeph, and ſet off to meet William Herſchel, who expected me. Count Andreani and William Thornton were of the party.

* *Columba Nicobarica*, of Linnæus, *Syſt. Nat.* page 283, 27.—*Columba Nincombar Indica*, of Klein, page 120, 28.—*Pigeon of Nincombar*, of Albin, vol. iii, page 20, with the figure of the male; plate 47, the figure of the female; both badly coloured.—*Pigeon of Nincombar*, of Briſſon, vol. i. p. 153, 44, no figure.—*Pigeon of Nincombar*, of Edwards; *Hiſtory of Birds*, plate 339, a very good figure.

The

The houſe in which Mr. Herſchel makes his obſervations ſtands at one end of the foreſt of Windſor, and is about twenty miles diſtant from the houſe of Sir Joſeph Banks; but, with good horſes, and in an Engliſh chaiſe, the journey may be performed in three hours.

This was about the time when highwaymen uſually come upon the road, to prey upon the imprudent traveller. They are numerous, and perform their dangerous buſineſs on horſeback; ſome of them are even mounted on hunters; but we were informed that, though our danger would have been great on the evening before, we were ſafe that night, which was Sunday, as the road was covered with people of all ranks, who, having paſſed the day in the country, were returning to London, to be ready to reſume their uſual occupations on Monday morning.

The evening was moſt beautiful, the air was calm and mild, and the ſky ſparkled with ſtars: the road was as carefully made, and as ſmooth, as the avenue of a public walk. It was bordered with quickſet hedges, almoſt all in flower, and ſerving to incloſe

incloſe charming gardens and parks, orna-mented with beautiful trees, in the midſt of which were ſcattered ſo many ſimple, but elegant houſes, that they ſeemed to diſpute the ground with each other.

The road was, at this time, covered with a multitude of men and women, on horſe-back and in coaches. Carriages of every kind, moſt of them very elegant, but all of them ſubſtantial and commodious, and many of them, with ſuperb equipages, ſucceeded each other without interruption, and with ſuch rapidity, that the whole ſeemed the work of magic: it certainly announced an opulence and population, of which we can have no idea in France. All was life, motion, and activity; and, by a contraſt only to be ſeen in this country, all was calm, ſilence, and order. A tacit and inviolable reſpect for each other ſeemed to regulate the individuals compoſing this impetuous maſs of population, which was directed to one point. A ſcene ſo extraordinary, faintly illuminated by the ſtars, tranſports one, who ſees it for the firſt time, into the fields of Elyſium.

But the ſtory of Elyſium is fabulous, and that

that which I have related is real; for it is what I have ſeen, and what all Engliſhmen, and thoſe who know their country, will acknowledge to be a juſt deſcription. How then does it happen, that ſo much tranquillity and order is preſerved among an immenſe multitude of perſons in motion? It has its origin in the ſtate of the public mind, which is well formed; the education, which is good; and even the forms of worſhip, which are here ſtripped of much of that vain ſuperſtition they have in Roman Catholic countries, and which permit the day, conſecrated to repoſe, to be paſſed in innocent relaxation.

I arrived at Mr. Herſchell's about ten o'clock. I entered, by a ſtaircaſe, into a room which was decorated with maps, inſtruments of aſtronomy, and natural philoſophy, ſpheres, celeſtial globes, and a large harpſichord.

Inſtead of the maſter of the houſe, I obſerved, in a window at the farther end of the room, a young lady ſeated at a table, which was ſurrounded with ſeveral lights; ſhe had a large book open before her, a pen in her hand, and directed her attention alternately

ternately to the hands of a pendulum-clock, and the index of another inſtrument placed beſide her, the uſe of which I did not know: ſhe afterwards noted down her obſervations.

I approached ſoftly on tiptoe, that I might not diſturb a labour, which ſeemed to engage all the attention of her who was engaged in it; and, having got cloſe behind her without being obſerved, I found that the book ſhe conſulted was the Aſtronomical Atlas of Flamſtead, and that, after looking at the indexes of both the inſtruments, ſhe marked, upon a large manuſcript chart, points which appeared to me to indicate ſtars.

This employment, the hour of the night, the youth of the fair ſtudent, and the profound ſilence which prevailed, intereſted me greatly. At laſt ſhe turned round her head, accidently, and diſcovered how much I was afraid to diſturb her; ſhe roſe ſuddenly, and told me ſhe was very ſorry I had not informed her of my arrival, that ſhe was engaged in following and recording the obſervations of her brother, who expected me, and who, in order that he might not loſe the precious opportunity of ſo fine a night, was then buſy in his obſervatory.

"My

" My brother," ſaid Miſs Caroline Herſchel, " has been ſtudying theſe two hours; " I do all I can to aſſiſt him here. That " pendulum marks the time, and this in- " ſtrument, the index of which communi- " cates by ſtrings with his teleſcopes, in- " forms me, by ſigns which we have agreed " upon, of whatever he obſerves. I mark " upon that large chart the ſtars which he " enumerates, or diſcovers in particular " conſtellations, or even in the moſt diſtant " parts of the ſky."

This fraternal communication, applied to a ſublime but abſtruſe ſcience, this conſtancy of ſtudy during ſucceſſive nights, employed in great and difficult obſervations, afford pleaſing examples of the love of knowledge, and are calculated to excite an enthuſiaſm for the ſciences, ſince they preſent themſelves under an aſpect ſo amiable and ſo intereſting.

Mr. Herſchel's obſervatory, to which I repaired ſome moments after, is not built on an eminence, nor on the top of a houſe; he has preferred placing it on a verdant plain, where the wind is not ſo likely to ſhake his inſtruments, and which is ſuffi-

ciently extenſive to permit all the motions ſuch large machines require.

His teleſcopes are elevated in the air, and mounted in a moſt ſimple and ingenious manner: a young man is placed in a kind of chamber below, who, by the means of machinery, turns the teleſcope and the obſerver together in a circle, with a gradual motion correſponding to that of the earth; thus the reflexion of the ſtar obſerved is retained on the metallic mirror.

Theſe large machines are, beſides, conſtructed with that preciſion, ſolidity, and care, which renders them capable of bearing the intemperateneſs of the air; and the mirrors are ſo diſpoſed, that they can be taken out and replaced at pleaſure, with the greateſt facility, notwithſtanding they are of conſiderable weight.

Here I ſaw that ever-memorable teleſcope with which the eighth planet was diſcovered*. Mr. Herſchel gave to it the

* It was diſcovered in 1781; its motion is from weſt to eaſt, like that of the other planets. By obſerving it attentively with the largeſt teleſcopes, Herſchel has diſcovered two ſatellites moving round the planet, in orbits nearly circular, and almoſt perpendicular, to the plane of the ecliptic.

name

name of the King of Great Britain, and called it *Georgium Sidus.* But all aſtronomers, actuated by a feeling of general gratitude, have, with one unanimous voice, unbaptiſed it, and given it the name of *the planet of Herſchel**.

This teleſcope, with which I had the pleaſure of making obſervations during two hours, is only ſeven feet long, and ſix inches ſix lines in diameter. Mr. Herſchel aſſured me, that he had made more than one hundred and forty mirrors with his own hands, before he reached that degree of perfection, to which he at laſt brought them. A teleſcope of ſix feet length is placed beſide this one.

This celebrated aſtronomer has not confined the ſize of his teleſcopes to the laſt meaſure; there are two others, which are twenty feet long, mounted on large ſtand-

* Laplace, in his learned work, the *Expoſition of the Syſtem of the World*, calls this planet *Uranus.* My correſpondence with the members of the Royal Society of London having been ſuſpended ſince the commencement of the war, I am ignorant of the reaſon of this change; but I preſume, that it is owing to the modeſty of Mr. Herſchel, who has, doubtleſs, refuſed an homage ſo juſtly, and ſo univerſally, paid to him by the learned world.

ards, riſing above the houſe. The diameter of one of theſe teleſcopes is eighteen inches three-fourths, and the mirror weighs one hundred and fifty pounds.

As theſe ſuperb inſtruments are of the Newtonian kind, which require the obſerver to be beſide the object-glaſs, Mr. Herſchel has conſtructed an apparatus of ingenious mechaniſm, by which the farther end of the teleſcope can be reached with eaſe and ſafety. There the obſerver finds a turning chair ſo diſpoſed, as to enable him to ſit at his eaſe, and follow the courſe of the ſtars. A domeſtic, placed below the teleſcope, by means of an ingenious combination, moves it ſoftly and gradually along with the obſerver, and all the apparatus.

Thus William Herſchel has been enabled to diſcover, diſtinctly, thoſe innumerable ſtars, which form the moſt pale and diſtant part of the galaxy.

With theſe inſtruments he has been enabled to obſerve that multitude of double ſtars, as well as ſo many nebulæ, with reſpect to which aſtronomers had only vague and uncertain notions; with them, too, he has undertaken

undertaken to count the ſtars of the ſky, and has made moſt aſtoniſhing diſcoveries.

Placed at the upper end of his teleſcope, when the indefatigable aſtronomer diſcovers in the moſt deſart parts of the ſky a nebula, or a ſtar of the leaſt magnitude, inviſible to the naked eye, he informs his ſiſter of it, by means of a ſtring which communicates with the room where ſhe ſits; upon the ſignal being given, the ſiſter opens the window, and the brother aſks her whatever information he wants. Miſs Caroline Herſchel, after conſulting the manuſcript tables before her, replies, brother, ſearch near the ſtar *Gamma*, *Orion*, or any other conſtellation which ſhe has occaſion to name. She then ſhuts the window, and returns to her employment.

That man muſt be born with a very great indifference for the ſciences, who is not affected by this delightful accord, and who feels not a deſire that the ſame harmony ſhould reign among all thoſe who have the happineſs to cultivate them. How much more rapid would their progreſs then be!

We commenced our obſervations with the *Milky-way*.

The teleſcope of twenty feet diſcovered

to us, in the paleſt and moſt diſtant part of the heavens, an immenſe number of bright ſtars, quite diſtinct and ſeparate from each other.

Mr. Herſchel then directed the inſtrument to the ſtar in the foot of the Goat, which emitted ſo ſtrong a light as to affect the eye. On making its light fall upon a paper written in very ſmall characters, we could diſcern and count the lines with eaſe. It is curious thus to diſtinguiſh objects by the glimmering of a ſtar, that is, a ſun many hundreds of millions of miles removed from the confines of our ſyſtem.

The double ſtars, which are not viſible with the moſt powerful acromatic glaſſes, appear ſeparate and very diſtinct, when viewed with the teleſcope of twenty feet long.

Mr. Herſchel made me obſerve the nebulæ of M. Mercier, at firſt with the teleſcope of ſeven feet, that is, with the one which ſerved to diſcover the planet. Theſe little ſpecks appear ſtill nebulous with that inſtrument; and one perceives only a feeble and obſcure glimmering. But the teleſcope of twenty feet permits one no longer to doubt that they are cluſters of ſtars, which

appear

appear confuſed only from their immenſe diſtance; by this teleſcope they are found to be perfectly diſtinct.

Mr. Herſchel requeſted me to direct my principal attention to the ſtars which he was the firſt to diſcover to be of different colours from each other, and among which ſome are ſeen that border on blue, others on orange, and ſeveral on a bluiſh colour, &c.

It is certainly neither to an optical illuſion, nor to the effect of the mirrors and lenſes, which Mr. Herſchel uſes, that we ought to attribute this difference of colour. I ſtarted every poſſible objection upon the ſubject; but the learned obſervator always anſwered them by facts, to which it would be unreaſonable to reply. Thus, for example, he repeatedly directed the teleſcope to two double ſtars of pretty nearly the ſame magnitude, and ſeparated from each other by a ſmall interval only; that is, ſmall in appearance, for the interval muſt be immenſe if we conſider their diſtance from the earth. Both were of the ſame colour, and emitted the common white light of the ſtars.

On directing the ſame teleſcope immediately after to other double ſtars near them,

the one appeared to be evidently blue, and the other of a ſilver colour. The blue ſtar was in ſome inſtances on the right, and in others on the left. I ſaw alſo ſome ſingle ſtars of a blue appearance, ſeveral of a bluiſh white, and others of an orange colour.

Mr. Herſchel ſaid to me with much modeſty, that this diſcovery was not of very great merit, ſince it was eaſy to make it without recurring to large teleſcopes; acromatic ones with large object-glaſſes being ſufficient to diſcover the coloured ſtars above mentioned.

The obſervations, however, of Mr. Herſchel were at firſt diſputed, for it is much eaſier to deny than to examine. But they were ſoon confirmed, as they deſerved to be, by the aſtronomers of Germany and Italy, and by M.M. Delaſſini, Mechain, &c. of the obſervatory of Paris.

Mr. Herſchel ſhewed me a pretty large work on the ſtars; which he deſigns to publiſh as ſoon as it is brought to a concluſion. He has confirmed what has been long ſince obſerved, that ſeveral ſtars diſtinctly marked in the ancient catalogues, and of which ſome are even laid down in the celeſtial Atlas of Flamſted,

Flamſted, have entirely diſappeared. It is thus probable, that there ſometimes happen great revolutions and terrible cataſtrophes in ſeveral parts of the ſyſtem of the univerſe; ſince, if the ſtars were ſuns, their extinction muſt have annihilated the organiſed beings who exiſted on the planets which they illuminated*.

Jupiter, viewed with the teleſcope of twenty feet, appears much larger than the full moon †. His parallel belts are very diſ-

* "Sometimes," ſays Laplace in his *Expoſition du Syſtème du Monde*, tome i. page 88. "ſtars have been "obſerved to appear on a ſudden, and then to diſappear, "after ſhining for a while with the ſtrongeſt luſtre. Such "was the famous ſtar obſerved in 1572, in the conſtella- "tion of Caſſiopea. In a ſhort time it ſurpaſſed the "brightneſs of the moſt ſplendid ſtars, and even of Ju- "piter itſelf. Its brightneſs then decreaſed, and ſixteen "months after its diſcovery it entirely diſappeared, with- "out changing its place in the heavens. Its colour un- "derwent ſeveral conſiderable alterations; having been "at firſt of a bright white, then of a reddiſh yellow, and "laſt of all of a lead-coloured white."

† This is not aſtoniſhing, when we reflect that Jupiter is at leaſt a thouſand times bigger than the earth. "Ju- "piter," ſays Laplace, "is at leaſt five times farther "from us than the ſun. When its apparent diameter is "120 ſeconds, the diameter of the earth would not ap- "pear, at the ſame diſtance, under more than an angle "of 11 ſeconds. The bulk of Jupiter is therefore, "at leaſt, a thouſand times greater than that of the "earth." *Expoſition du Syſtème du Monde*, par Laplace, tome i. page 78.

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tinct, and his ſatellites are of a truly aſtoniſhing magnitude.

On directing the ſame teleſcope towards Saturn, we ſaw his ring in the moſt diſtinct manner, and alſo the ſhadow which it projected on the body of that immenſe and ſingular planet. Mr. Herſchel ſhewed me the ſky, and even ſeveral ſtars, in the interval between the moveable ring and the planet. By means of ſome luminous points which are remarked in the ring, he was enabled to diſcover that this ſolid circle has a rotation from weſt to eaſt in the ſame manner with the other planets of our ſyſtem.

The micrometer which Mr. Herſchel uſes is compoſed ſimply of two threads of ſilk, very fine, well ſtretched and parallel, which may be moved to a greater or ſhorter diſtance at pleaſure. The inſtrument of parallel threads was known before, but this acute obſervator has perfected it, by finding an eaſy method of turning one thread over the other at pleaſure; ſo that, on placing them in the teleſcope, he can take angles with the minuteſt preciſion.

The inventor of ſuch large teleſcopes is far from having confined himſelf to thoſe

of

of twenty feet long. He was engaged in making the neceſſary preparations, to conſtruct one of forty feet in length, and of a proportionable diameter *.

Mr. Herſchel's intention in conſtructing teleſcopes of this great ſize, is not ſo much to magnify the object, as to obtain, by the aid of mirrors of ſuch a vaſt field, a more conſiderable quantity of light. This project is new and excellent. He told me, that he expected to encounter great difficulties in carrying to perfection a teleſcope of that dimenſion and weight; but that he, at the ſame time, expected ſuch great effects from it, that nothing ſhould be capable of diſcouraging his progreſs †.

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* The mirror is four feet in diameter, and weighs two thouſand weight: the teleſcope, with its apparatus, weighs forty thouſand weight. "It gives ſo much light," ſays Lalande, who ſaw it when finiſhed, "that the nebula "of Orion ſeen through it, emits a brightneſs like that of "noon day." *Aſtron.* tome ii. p. 635, *nov. edit.*

† Since that period, this aſtoniſhing teleſcope has, with immenſe labour, been carried to the higheſt point of perfection. William Herſchel himſelf, in a letter to M. Watſon, dated the 10th of September, 1791, ſpeaks of it as follows:—"I have, as uſual, been much occupied in "poliſhing mirrors, for teleſcopes, of all ſizes, in order to "bring to perfection that difficult part of optics. It "would,

I remained until daylight in that aſtoniſhing obſervatory, conſtantly occupied in travelling in the heavens, with a guide, whoſe boundleſs complaiſance was never wearied by my ignorance, and the importunity of

" would, truly, be impoſſible to conceive the time which " I have ſpent, and the pains which I have taken, to ac- " compliſh this end. But I have been amply compenſated " by the pleaſure which always accompanies the purſuit of " a favourite object, and by the ſucceſs which I flatter " myſelf I have obtained. My teleſcope of forty feet is " actually the beſt inſtrument I have in my poſſeſſion; " that is to ſay, it enables me to obſerve better than any of " my other teleſcopes, thoſe objects which are moſt diffi- " cult to be ſeen diſtinctly, ſuch as Saturn, his ſatellites, " and his ring, or rather his rings; for I have lately tranſ- " mitted to our preſident a paper relative to that planet, " in which I have clearly ſhewn that it has two diſtinct " rings, ſeparated from each other by a conſiderable diſ- " tance—ſuch, that with my teleſcope of forty feet, I have " ſeen the ſky very diſtinctly through this ſpace, the ex- " tent of which is 1741 of our miles: the diameter of the " exterior ring, meaſured with the ſame inſtrument, ap- " pears to me more than 222 of our miles. I have alſo " proved, in the ſame paper, that the fifth ſatellite of Saturn " turns round its axis in 79 days, 7 hours, and 47 mi- " nutes; a time equal to that of its revolution round " the planet: thus its movement, in this reſpect, exactly " reſembles that of the moon, whoſe revolution on her " axis is made preciſely in the ſame time ſhe takes to paſs " round the earth." *Journal of Experimental Philoſophy and Natural Hiſtory*, 1792. It ought not to be omitted, that Mr. Herſchel has diſcovered two new ſatellites belonging to Saturn, with the ſame teleſcope.

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my queſtions. I paſſed about ſeven hours there, employed without intermiſſion in obſerving the ſtars. It was impoſſible to think the time long, when ſpent in an employment of ſo profitable, and, with reſpect to me, curious, information. That delightful night appeared no more than a dream to me, and ſeemed to laſt only a few inſtants; but the remembrance of it is indelible; and the grateful recollection of the kindneſs with which Mr. Herſchel, and his intereſting ſiſter, condeſcended to receive me, will never be eraſed from my heart.

I left *Slough* (the name of the place where Mr. Herſchel reſides) about eight in the morning, to go to Kew; where Sir Joſeph Banks had appointed me to meet him, for the purpoſe of ſhewing me the whole of the ſuperb gardens of that place, particularly that of botany.

Gardens of Kew.

This charming place is ſeven miles from London. I ſhall not enter into a deſcription of the houſe, the pleaſure-gardens, the temples, the bridges, or of the towers, which decorate them; I ſhall confine myſelf to what

what relates to the garden for botanical inſtruction. George III. has been careful to aſſemble there the rareſt vegetable productions from all parts of the globe. By this he has rendered a ſignal ſervice to botany, as he has performed a no leſs important one to aſtronomy, by ſo honourably encouraging the labours of Herſchel, and enabling him to conſtruct the largeſt and moſt perfect teleſcopes which mankind have ever yet witneſſed.

The gardens of Kew are ſo well laid out, and ſo well kept, the order and the taſte which they exhibit are ſo admirable, and art has here ſo ſtudiouſly endeavoured to reſemble all that is beautiful and ſtriking in nature, that I give them the preference to any thing of the kind that I have ever ſeen.

The weather was delightful, and the ſeaſon had been ſo favourable, that the rareſt and moſt delicate vegetables diſplayed a luxuriancy and variety of foliage, bloſſoms, fruits, and perfumes, which formed an enchanting whole.

What moſt attracted my admiration in this garden of exotic trees and plants, was an exquiſite neatneſs, a pure taſte, and a judicious

judicious order, which muſt there render inſtruction amiable. The mixing of the trees and ſhrubs of both hemiſpheres is ſo well conducted, and ſo perfectly harmonized, that the mind ſeems to reſt every where with the ſame ſatisfaction: its ſenſations are ſoothing, but varied; every thing charms, and nothing fatigues it.

The green-houſes are diſpoſed with much judgment. Some of them have only a moderate heat, for the plants which thrive in a mild temperature; ſome receive a ſtrong and parching heat, ſuited to thoſe of the climate of Africa; and others, deſigned for plants found in parts of America, where the atmoſphere is loaded with vapours, receive a humid heat. It is with all theſe precautions, and theſe imitations of nature, aided by inceſſant care, that plants the moſt precious, and the moſt difficult to preſerve, grow here almoſt as well as in their native ſoil.

I ſaw, with conſiderable intereſt, in one of the green-houſes, a curious plant, which had juſt come in flower; it was the *hediſarum girans*, brought from the Eaſt Indies, in 1775, by Doctor Patrick Ruſſel.

This

This tall and elegantly-formed plant is endowed by nature with a ſenſibility ſo remarkable, that, if placed under glaſs frames, inacceſſible to the air, about mid-day, when the ſun is moſt powerful, its lateral leaves, which are formed in the ſhape of a ſpear, exhibit a ſpontaneous movement of aſcent and deſcent, ſuch as might lead one to imagine that their motion is the effect of art *.

Another ſpecies of the *hediſarum*, brought from Cochin China by Sir Joſeph Banks, was likewiſe in bloſſom at the ſame time. Its leaves are of a form ſo extraordinary, and of a tint ſo fantaſtic, that it has received the name of the *bat hediſarum*; but the contour of the leaves, their lightneſs, and their colour, have a much nearer reſemblance to the wing of a butterfly †.

Amidſt a multitude of rare and ſingular plants, one of them attracted my particular

* *Hediſarum foliis ternatis ovali-lanceolatis, obtuſis lateralibus imminutis.* Aiton, Hortus Kewenſis. *Hediſarum girans. Linn. ſupp.* 332.

† *Hediſarum foliis ſimplicibus ternatiſque; foliis intermediis bilobis; lobis lanceolatis divaricatis, leguminibus pliceatis.* Aiton, Hortus Kewenſis. *Hediſarum veſpertilionis. Linn. ſupp.* 331. *Bat-winged hediſarum, nat. of Cochin China. Introd.* 1780, *by Sir Joſeph Banks: fl. July and Auguſt.*

attention;

attention: it was the *dionea muſcipula*. I had ſeen it once before in the botanical garden of Paris. Franklin has cauſed it to be ſent over in its native ſtate from the marſhes of South Carolina as a preſent to Bouffon. It arrived in good condition: but it was ſo delicate, that it lived only ſix months. In the garden of Kew, however, this plant was in the beſt poſſible ſtate of vegetation *.

This extraordinary plant has thick leaves, like thoſe of certain oily plants. They are diſpoſed in the form of hinges, covered with prickles, and furniſhed by nature with a honied ſubſtance. The flies, attracted by the ſweetneſs of the liquor, come to feaſt themſelves upon it; but the plant is endowed with ſuch acute ſenſibility, that it is irritated by the ſmalleſt touch; the leaf doubles up its folds, ſhuts upon itſelf, ſeizes the inſect with its prickles, pierces and kills it. Nature thus appears as inexhauſtible in her means of deſtruction, as in her means of creation.

* *Dionea muſcipula, cal. 5 phyllus. Petala 5, cap. ſ. unilocularis, gibba polyſperma.* Aiton Hortus Kewenſis. *Dionea, Linn. Mant. 238. Venuig. fly-trap. Nativ. of Carolina, fl. July and Auguſt.*

The *magnolia grandiflora*, planted on a riſing ground, and forming trees of a great height, were covered over with their beautiful flowers, which perfumed the air. Their foliage of a bright green above, and of a pale yellow and variegated colour below, produced a very ſtriking effect; they were contraſted with trees of a ſilver-coloured, and others of a reddiſh, foliage.

Evergreens, reſinous trees of all kinds, loaded with their ſcaly fruit, and of various ſhapes, were ſeen in conjunction with thoſe of a ſoft green, with umbrageous trees, with ſome of downy, ſome of indented, and others of palmated, leaves. From theſe various intermixtures, combined with art, and arranged with taſte, there reſulted a variety of forms, attitudes, and colours, which produced the moſt ſtriking contraſts, without ever exhibiting an injudicious contrariety.

The polypodes, ferns, and different plants which require coolneſs and the ſhade, are placed in appropriate ſituations. The heaths, honeyſuckles, brooms of various kinds, ivies, and myrtles, appear in their vicinity.

But nothing aſtoniſhed me ſo much as the

the admirable art, by which moſſes, the moſt delicate capillary herbs, and even ſome *lichens*, have been raiſed with ſuch ſucceſs, as to unite in one place the moſt complete and the beſt aſſorted diſplay of the richeſt vegetable productions of nature.

To accompliſh this purpoſe, there was collected a great quantity of lavas, of which Sir Joſeph Banks had brought a plentiful ſupply on his return from Iceland, where he had gone to viſit the volcano of Mount Hecla. The ballaſt of his veſſel conſiſted entirely of its lavas; and it was this circumſtance that ſuggeſted the fortunate application that has been made of them. As theſe lavas are full of cavities, fiſſures, and wrinkles, ſpongy, and capable of imbibing and long retaining water, it was reſolved to form thick borders of them more or leſs elevated, round the verges of a ſhady piece of ground, appropriated to this moſs-garden, which is the only one of its kind in the world.

This numerous family of *cryptogames*, ſo varied in form and colour by their myſterious and wonderful fructification, grow up and thrive in the cavities of theſe little artificial rocks in a manner which appears almoſt

miraculous, and which does honour to him who firſt conceived that happy deſign.

The experiment having perfectly ſucceeded, they wiſhed to practiſe it on a greater ſcale. To effect this, the lavas imported from Iceland being exhauſted, they had recourſe to factitious lavas, which were formed of lumps of clay, vitrified in a violent fire of pit-coals, and which were found to anſwer nearly the ſame purpoſe.

It muſt be allowed, that the climate of England, which is very favourable to the growth of thoſe plants, contributes much to the ſucceſs of this pleaſing invention. I am of opinion, however, that ſimilar attempts may be ſucceſsfully made in other places, and that the grand botanical gardens may thus be enriched with an aſſemblage of objects, which cannot, in general, be ſtudied but in herbals, or by performing voyages, which one is not always in circumſtances to undertake.

Mr. William Aiton, who is the manager of this magnificent garden, and who has contributed to bring it to its preſent ſtate of perfection, is occupied in writing a deſcription of its numerous and rare plants, which he

he has cultivated with ſo much knowledge, zeal, and application. This work is expected with impatience, and will be received with intereſt by botaniſts, and by all thoſe who know how to eſtimate the talents of Mr. Aiton.

This modeſt naturaliſt exerted himſelf in the moſt affable manner, as did alſo Sir Joſeph Banks, to point out and explain every thing that could intereſt my curioſity. I felt the more indebted to their extreme complaiſance, as my ignorance obliged me to trouble them repeatedly with importunate queſtions; and I gladly ſeized this opportunity to renew my apology, and my thankful acknowledgments*.

British Museum.

This immenſe collection of ſcientific and curious objects is depoſited in the vaſt houſe

* Mr. Aiton publiſhed, in 1789, an excellent work, containing a deſcription of the plants of this garden, under the title of *Hortus Kewenſis, or, a Catalogue of the Plants cultivated in the Royal Botanic Garden at Kew. By William Aiton*, 3 *vols. in* 8*vo. fig. London*, 1789. A ſhort time after the publiſhing of this book, death deprived his friends and botany of this eſtimable naturaliſt. His ſon ſucceeded him in the management of Kew gardens.

of the late Duke of Montague in Great Ruſſel-ſtreet.

This muſeum is compoſed of manuſcript and printed books; of Egyptian, Etruſcan, Greek and Roman antiquities; Indian, Chineſe, and Japaneſe idols; of the veſtments, weapons, and utenſils of the iſlanders of the South Seas and other ſavage nations; of quadrupeds, amphibious animals, birds, inſects, fiſhes, ſhells, and other marine productions; of minerals, petrifactions, and foſſils of every kind.

This immenſe aſſemblage of objects was partly formed by the celebrated Hans Sloane. It is a pity that the collection was not allowed to remain as he originally left it. Had no additions been made to it, and had it been allowed to retain the modeſt title of *Sloane's Muſeum*, many would doubtleſs have been anxious to viſit the collection of that indefatigable naturaliſt, and would have viewed with as much aſtoniſhment as ſatisfaction, what the love of ſcience, aided by an affluent fortune and liberal diſpoſition, had been able to perform.

But I am not pleaſed that the collection of a private individual, to which there has been

been ſince ſuperadded a crowd of heterogeneous objects, calculated rather to diſtract, than to command the attention, ſhould poſſeſs the title of *The Britiſh Muſeum.*

A nation, reſpectable from the highly perfect ſtate of her commerce and manufactures, and the importance of her navy, the reſults of a multitude of difficult combinations and profound knowledge, ought to have monuments worthy of herſelf, and more analogous to the grandeur and ſtatelineſs of her character.

The Engliſh have been reproached with not giving ſufficient encouragement to the ſciences, and eſpecially with not inveſting them with the conſideration which they merit. I cannot, I muſt confeſs, decide upon that charge. But if it were well founded, the government ſhould ſeem very little attentive to that in which it is moſt deeply intereſted; for thoſe who ſit at the helm of affairs are by far too enlightened to be ignorant that England has reaped more real glory and diſtinction from the uncommon geniuſes which ſhe has produced, than from her conqueſts in both the Indies, her fleets,

her battles, or her eternal parliamentary diſcuſſions.

All her political ſuperſtructure, notwithſtanding its utility, will a thouſand times diſappear, whilſt the name of the immortal Newton *, that of Napier †, of Halley ‡, of Bradley ||, and other illuſtrious philoſophers, will be held in veneration by all nations among whom war and the homicidal

* The glory of the Engliſh nation.—An immortal genius, who claims pre-eminence over all others, from his diſcovery of the principles of the celeſtial movements, and the laws of univerſal gravitation. His Principia is the greateſt and moſt aſtoniſhing work ever produced by the human mind.

† Napier, a Scotch Baron, who was the inventor of Logarithms, an admirable contrivance, "which," ſays Laplace, very juſtly, "by reducing the labour of many "months to that of a few hours, has in a manner doubled "the lives of aſtronomers, and ſaved them from the er-"rors and diſguſt inſeparable from long calculations;— "an invention ſo much the more ſatisfactory for the hu-"man mind, tha it has derived it wholly from its own "ſource. In the arts, man employs the materials and "the powers of nature to increaſe his own powers; but "here eve y thin, is his own production.

‡ Halley, whoſe profound inveſt gation of the Cometary Syſtem enabled him to diſcover and to predict the return of the comet which appeared in 1769.

|| An aſtronomer, f r ever celebrated by his diſcovery of the aberration of the fixed ſtars, and the nutation of the earth's axis.

fury

fury of conqueſt ſhall not have extinguiſhed the torch of intellect and knowledge, which enlightens the path of truth, the ſole object of man in the rapid career of life.

The Britiſh Muſeum contains many valuable collections in natural hiſtory; but, with the exception of ſome fiſhes in a ſmall apartment, which are begun to be claſſed, nothing is in order, every thing is out of its place; and this aſſemblage appears rather an immenſe magazine, in which things have been thrown at random, than a ſcientific collection, deſtined to inſtruct and honour a great nation.

It may be preſumed, that as long as this diſguſting confuſion is ſuffered to continue, no artiſt will ever be excited to go there, to acquire thoſe branches of information which relate to the materials he uſes, and the ſources whence they are derived.

Never will the painter repair thither to ſee and to ſtudy animals according to nature, and to admire the different modes of colouring, and the infinite variety of ſhades preſented by the plumage of birds, the gay attire of butterflies, and the oriental ſplendor of ſhells.

Never will the phyſician, who devotes his ſtudies

ſtudies to the curing, or alleviating the diſeaſes of his fellow-creatures, go to learn from that chaos the means of diſtinguiſhing with preciſion the beneficent productions, which in the various climates of the globe nature ſeems to offer to man, in order that he may mitigate or remove thoſe evils with which he is every where aſſailed.

Neither will the philoſopher, who loves to behold nature on a great ſcale, nor he who delights in ſtudying the details of that immenſe chain which ſeems to connect every ſpecies of being, and to unite its laſt link to the firſt, find any thing to intereſt them in the midſt of ſuch diſorder.

In a word, youth, ſo inquiſitive, and ſo fond of novelty, will here find no excitement to ſtudy, from that attractive lure, which captivates by the elegance and correctneſs of arrangement, and which is ſo well calculated to create or unfold a taſte for the hiſtory of nature.

But that arrangement, which has no exiſtence at preſent, may one day be accompliſhed. I ſincerely wiſh it for the progreſs of natural ſcience; a nation, whoſe political and commercial relations extend to both hemiſpheres,

miſpheres, and whoſe ſhips traverſe ſo many ſeas, may, whenever ſhe pleaſes, eaſily form an aſſemblage of the moſt ſplendid and richeſt productions of nature. The National Muſeum of Natural Hiſtory at Paris, which is ſo juſtly eſteemed ſuperior to every collection of the kind, would not then be the only cabinet worthy of admiration; and thus a national rivalſhip, much more honourable than that which ariſes from cabinet intrigue or vulgar prejudice, would contribute to the enlargement of human knowledge, and thereby to the happineſs of the whole human race.

CHAP.

CHAPTER III.

Arts and Manufactures.—Philoſophical and Mathematical Inſtruments.

IN England, the makers of inſtruments uſed in the ſciences enjoy merited conſideration. They are, in general, men of great information; and ſpare neither time nor expence to carry their workmanſhip to the higheſt degree of perfection. The demands of the navy, and the great number of perſons whoſe wealth enables them to pay well for the beſt-conſtructed inſtruments, are among the cauſes which have concurred to form artiſts of high reputation, and who have ſerved as inſtructors to others. I gladly embraced the opportunity of viſiting ſeveral of them, under the auſpices of Meſſrs. Whitehurſt and Cavallo.

I found the ſkilful and modeſt Ramſden occupied in making an inſtrument ſimple in appearance, but which demanded much care and many combinations to render it perfect.

It

It was required to meaſure on the ground a baſe of four thouſand two hundred and eighty-ſix toiſes, ſo as to avoid the defects of the ordinary inſtruments of meaſuring; which, whether of wood or metal, are liable to be expanded by heat and contracted by cold, and to ſeveral other inconveniencies, that do not permit one to depend on their perfect accuracy, whatever precautions may be taken in uſing them.

To effect this purpoſe, it was propoſed to uſe rods made entirely of glaſs; and it was in preparing theſe that Ramſden was then employed. The glaſs tubes were executed with all poſſible care, in the glaſs manufactory of Parker, to the beſt of my recollection. They were all of the ſame diameter, and ſtraight as the moſt perfect ruler.

They were very long, and fixed on proper ſupports, with a water level to each; they could be elevated or depreſſed horizontally at pleaſure. As theſe rods were to be uſed by placing them end to end, to aſcertain the point of contact with greater preciſion, the extremities of each were carefully cut and ground down with emery; and on being diſpoſed in the requiſite order, they were gradually

dually brought to touch each other by means of a vice. By this method great baſes were obtained with a preciſion of meaſurement, of which there had formerly been no example *.

I had much pleaſure in converſing with Ramſden. I went to ſee him ſeveral times; and I purchaſed ſeveral inſtruments at his ſhop. He poſſeſſes all the modeſty and ſimplicity of manners of a man of great talents.

There are alſo in London other able artiſts employed in making the larger inſtruments of aſtronomy, mathematics, and experimental philoſophy;—ſuch as Meſſrs. Bird, Dolland, Adams, Nairne, Blund, Hunter, &c.

It contains likewiſe many clock and watchmakers who excel in their art.

MANUFACTURES.

Wedgewood.

The black pottery, known under the name of *baſaltes*, which has the colour, the

* See, upon this ſubject, *Lalande's Aſtronomy*, tome iii. page 15, of the thirteenth edition, 1792; ſee alſo *Philoſophical Tranſactions*, 1785, page 385, by General Roy and Mr. D'Arby.

hardneſs

hardneſs, and the opacity, of the volcanic ſtone of that name, and its application by Mr. Wedgewood, to buſts, baſſo-relievos, and vaſes of the fineſt antique forms, do honour to the taſte and ability of that celebrated manufacturer.

With other materials he has ſucceſsfully imitated the Etruſcan vaſes, of which England poſſeſſes a very rich collection, owing to the exertions of Sir William Hamilton, who procured them during his embaſſy at Naples, and to the liberality of parliament which purchaſed them, with the view of facilitating for the Engliſh artiſts the ſtudy of the moſt excellent models.

Wedgewood has infinitely varied the art of preparing and combining the ſeveral earths, ſo as to form them into the moſt beautiful productions. He well knew that porcelains have been brought to the higheſt perfection in France, and that nothing can ſurpaſs thoſe of Sêve, and ſome other manufactories, which have branched out from it; he therefore choſe a different courſe, and, diſdaining to be a mere copyiſt, he has, in a manner, created a kind of pottery peculiar

to

to himſelf, and which might be regarded as abſolutely original, if the veſſels which come from China, of red and brown earths, without ſemi-tranſparency, and of great hardneſs, had not ſerved him as models. He has, nevertheleſs, the merit of having excelled the Chineſe, by diſcovering new compoſitions, and more eſpecially by adopting the moſt elegant ſhapes.

As his pottery is uſed in every part of Europe, and as example is more efficacious than any theory, or the beſt written inſtructions, it is evident that Wedgewood has contributed to a ſort of revolution in the art, by multiplying agreeable forms, and accuſtoming the eye to enjoy their graceful proportions.

This able artiſt having daily occaſion to ſtudy the action and different modifications of fire, acquired the power, in a manner, of taking that element captive, and directing it at pleaſure. The courſe of his inquiries led him to invent an inſtrument for aſcertaining various degrees of heat, which bears his name, and does honour to his genius. The *pyrometer of Wedgewood* has a diſtinguiſhed place

place in all the laboratories of chymiſtry and experimental philoſophy*.

But that which has greatly increaſed the fortune of Wedgewood, and procured an immenſe branch of commerce to England, is his common pottery, known in France by the name of Engliſh-ware, and at London by that of queens'-ware.

Its excellent workmanſhip, its ſolidity, the advantage which it poſſeſſes of ſuſtaining the action of fire, its fine glaze impenetrable to acids, the beauty and convenience of its form, and the cheapneſs of its price, have given riſe to a commerce ſo active and ſo univerſal, that in travelling from Paris to Peterſburgh, from Amſterdam to the fartheſt part of Sweden, and from Dunkirk to the extremity of the ſouth of France, one is ſerved at every inn upon Engliſh-ware. Spain, Portugal, and Italy are ſupplied with it; and veſſels are loaded with it for the

* The celebrated Spallanzani has very ſucceſsfully applied it to determine the degree of fire neceſſary to fuſe the lavas in volcanos; he found, that a leſs degree of heat than that of ordinary glaſs-houſes was ſufficient for the purpoſe. See, upon this ſubject, vol. I. of Travels in the Two Sicilies, by Spallanzani.

Eaſt-Indies, the Weſt-Indies, and the continent of America.

This univerſal taſte, this invariable deſire to procure that ware, is a ſufficient demonſtration that, from its ſolidity, form, and cheapneſs, it is perfectly agreeable to thoſe who make uſe of it. In this point of view, Wedgewood has made an excellent diſcovery, and has deſerved well of his country, ſince he has given exiſtence to an extenſive branch of induſtry and commerce*.

PARKER'S

* France poſſeſſes all the materials requiſite to imitate to perfection the Engliſh ſtone-ware, ſuch as white clays, ſiliceous earths, minium, &c. A manufactory, eſtabliſhed ſome years ago at Montereau, produces potteries, which are not, it is true, equal to thoſe of England, but which, with ſome aſſiſtance and management, particularly that of employing pit-coal, would reach a higher degree of improvement.

Some very reſpectable citizens of Geneva, who commenced their labours with more intelligence and greater means, accompliſhed their object after repeated experiments. They made ſeveral journies to Paris, to ſolicit the tranſporting of their eſtabliſhment in France into the department of Iſere, to be nearer the kinds of earth which they employ, but ſcarcely were they attended to. I know not whether juſtice has been ſince done to their requeſts, or whether, weary of ſoliciting, they have at laſt renounced a project ſo uſeful for France; but this I well know, that upon every occaſion where the arts are ſtrangers to thoſe who adminiſter the finances of a great nation, it is deprived

of

Parker's Manufactory of fine Glass.

Thoſe who love the arts ought not to neglect to viſit the warehouſes and glaſs manufactory of Parker.

of its reſources, and compelled to have recourſe to the induſtry of its neighbours.

It is from this conviction, that the government thought they did well in prohibiting the importation of Engliſh manufactures; but every thing manufactured by them, of a ſuperior quality, and at a cheaper rate than among us, will be imported notwithſtanding, and will only become dearer than formerly. The Engliſh, who would, no doubt, wiſh to retaliate, will not be ſo ill-adviſed, as to prohibit the entry of our wine, which they cannot well do without. They have always ſubjected it to heavy duties of importation; the rich conſumers pay them, and the ſtate becomes a gainer.

I heard a man, who is well verſed in this matter, ſay, that it were a thouſand times better to permit the traffic of Engliſh merchandiſe, to impoſe taxes on it, and then to apply one-fourth of the produce, by a wiſe diſtribution, to the encouragement of French manufactures; we ſhould, by this means, ſoon have as good commodities as the Engliſh. It is by ſuch encouragement that we have been able to imitate their fine glaſs works; it is thus that, owing to the intelligence and attention of the miniſter Benezech, we have at Verſailles a manufactory of fire-arms, of a finer finiſh and more exquiſite workmanſhip, and alſo at a much cheaper price, than any made in London. Olivier, who has erected a very handſome manufactory in the ſtreet La Raquette, ſuburb Saint Antoine, has pretty well imitated the beſt productions of Wedgewood. It is unfortunate, that the ſtate of the finances has not admitted of giving this valuable artiſt that encouragement which he has well merited.

There they will ſee to what varied extent that ſubſtance, pure as the cleareſt ſpring water, and more delightful to the eye than cryſtal, may be faſhioned, in the hands of ſkilful artiſts, into cups, vaſes, baſons, and bottles of every form.

They will be aſtoniſhed at the dexterity and quickneſs with which the workmen cut, engrave, and poliſh into the pureſt brilliancy, thoſe articles which contribute to the purpoſes of luxury and ornament, the various veſſels which cover and decorate our tables, and the beautiful luſtres which illuminate them, and reflect the ſplendid colours of the priſm in a thouſand directions.

Parker, like all thoſe who are at the head of great manufactories in England, has made acquirements in more than one branch of knowledge; he has conſtructed a burning lens of a large ſize, and of remarkable effect: it is conſidered as the beſt of the kind ever made.

I had fixed a day with his friend, Mr. Whitehurſt, to be preſent at ſome experiments to be made with it; but, as often happens in London, the ſun was not viſible: it was not in my power, therefore, to judge perſonally

perſonally of the effects of this large burning-glaſs*.

A LARGE BREWERY.

It is by facts, more than by any other means, that an exact idea may be formed of what induſtry is capable of effecting among a people, active and animated with the genius of commerce.

A large brewery, which I viſited, on the ſouth ſide of Blackfriar's-bridge, excited alike my aſtoniſhment and admiration.

The buildings and yards, which are of a vaſt extent, have no other object than utility; every thing is ſolid, every thing is adapted to its purpoſe, but every thing is an abſolute ſtranger to oſtentation.

Seventy large horſes are employed in the

* The Engliſh glaſs works have been imitated in France: the firſt attempts were made, with ſucceſs, in the park of Saint Cloud, at the inſtigation and under the auſpices of Marie Antoinette, who loved and encouraged the elegant arts. That manufactory was tranſported to Creuzot, near Mount Cennis, in Burgundy, where it received the name of the queen's manufactory, on account of her having contributed to eſtabliſh it. It is formed on the moſt extenſive ſcale; very excellent glaſs works are made there; and it has already given riſe to ſimilar manufactories at Paris, and other places.

ſervice of this brewery. Of a hundred workmen, unceaſingly in motion, ſome prepare the malt and the hops, or are employed about the fires, the coppers, or the coolers; ſome rack off the beer, and others convey it into large vats, which I ſhall preſently deſcribe.

The beer is fermented in vaſt ſquare veſſels, raiſed to the height of the firſt floor; and pumps, diſpoſed with much art, facilitate the ſupply of water.

When the beer is made, it deſcends through pipes, and is diſtributed, by means of funnels, into a number of caſks, placed in an immenſe cellar. The beer becomes of a more perfect quality in thoſe caſks, where it remains, however, but a ſhort time; from them it is drawn off by long ſpouts, and transfuſed into a great reſervoir, whence it is again raiſed, by pumps, into vats of an aſtoniſhing magnitude, which are placed vertically, and the top of which cannot be reached without a ladder: a gallery goes round the places which contain theſe vats.

Four apartments, ſituated on the ground-floor, and of different dimenſions, are appropriated to receive them.

In

In the firſt, which is the ſmalleſt, there are ſix vats, containing each three hundred hogſheads; a hogſhead contains about two hundred and forty bottles: in the ſecond, there are twenty-eight vats, of four hundred hogſheads; in the third, fourteen of nine hundred hogſheads; and in the fourth, four of five hundred hogſheads each.

Thus the whole of them is capable of containing thirty-one thouſand ſix hundred hogſheads.

The ordinary quantity ſold, one year with another, is about a hundred and forty thouſand hogſheads. During the laſt war it was much more conſiderable, the proprietor of the brewery having had a contract for ſupplying the navy. One may form an eſtimate of the ſale at that period, from the duties yielded by the beer then made. I was aſſured, that they amounted to ten thouſand pounds ſterling a month.

It was not very long ſince this brewery had been ſold, on the death of the former proprietor; it was put to auction, and knocked down at the price of three millions two hundred and eighty-eight French livres.

It is remarkable that twenty-two bidders

contended for it, though it was neceſſary, not only to pay down that ſum, but to be able to advance as much more as would be requiſite to ſet ſo vaſt an eſtabliſhment in motion.

It is, perhaps, ſuperfluous to obſerve, that almoſt all the beer brewed in this extenſive work, is of the kind called *porter*, which is of a ſtrong body, capable of ſuſtaining long ſea voyages, and of being preſerved in bottles for many years: it is, indeed, neceſſary, in order to have it of a good quality, that it ſhould remain ſeveral months in the large vats.

Theſe vats, made of wood of the choiceſt quality, are conſtructed with an admirable ſolidity, juſtneſs, and preciſion, and alſo with an appearance of elegance: ſome of them have as many as eighteen hoops of iron; and ſeveral were pointed out to me, which had coſt ten thouſand French livres a-piece.

I have already ſaid, that they were all placed on end around the walls; but, on aſking what they ſtood upon, my conductor ſhewed me, that they reſted on brick arches of great ſolidity, and ſtrengthened by a number of thick upright pillars of wood. Their bottom

bottom was thus protected from the humidity of the ground, and it was more eaſily ſeen whether the beer eſcaped through them.

The top of the vat was carefully covered with thick planks, joined together in the moſt perfect manner, and theſe again were covered with fine ſand, ſix inches deep.

At a ſmall diſtance from this brewery, there is another for making malt-vinegar, fitted up in the ſame manner; but, in the latter, the vats ſtand in the open air, and occupy an immenſe yard. Their height and capacity are ſuch, that on entering the vaſt incloſure filled with theſe gigantic veſſels, ranged in different lines, one is apt to imagine, by an illuſion proceeding from the want of exact compariſon, that one ſees a ſucceſſion of ſhips of the line, lying by the ſide of each other in a harbour.

The vinegar made from ſtrong beer, of a good quality, is better than one would expect; there is no other kind uſed in any part of England, the importation of vinegar, made from wine, being ſeverely prohibited.

Manufactory of Turkey-Leather, of Parchment, and Shamois Leather.

I am pleaſed with ſeeing manufactures of every kind; they provide for our wants and conveniencies, and ſupply us with the materials of luxury. Theſe productions of induſtry are owing to the united efforts of men: they have contributed more than is generally believed to the development of the human faculties; and before they arrived at that pitch of perfection which they have attained among ſome nations, the arts muſt have paſſed through a thouſand eſſays, and have groped their way through a thouſand obſcurities, which announced that their progreſs is the ſame with that of the human mind, which proceeds by ſmall ſteps, and journeys but ſlowly in the path of diſcovery.

I like alſo to ſee the manner in which different nations exerciſe the ſame art; there are always particular proceſſes uſed in one country which are not practiſed in another.

We are acquainted with the cauſe of the excellent quality of the leather made by the Engliſh; it is principally owing to the pecuniary advances which they are in a condition to make, ſo as to permit the hides to remain longer

longer in the pits, and to ſome improvements in the workmanſhip.

At Annonai and Grenoble, ſkins for white gloves are manufactured, which ſurpaſs thoſe of England. But in England, they have for a long time had the art of making parchment, vellum, and particularly Turkey-leathers, of a quality ſuperior to ours.

It may, indeed, be ſaid, that the manufacture of Turkey-leather is ſtill in its infancy in France, though it exiſted there in conſiderable perfection formerly, if we may believe a celebrated author *. But the civil wars, particularly thoſe of religion, put to flight our fineſt manufactures, which were allured into Germany and England by toleration, the liberty of worſhip, and ſound policy.

I had a converſation upon this ſubject with a very intelligent Engliſhman, who propoſed to conduct me to a manufactory of this article, ſituated in one of the extremities of London, and directed by perſons of the name of Lorraine. I was told that I ſhould there ſee a preſs of very great force, the effect of

* Rabelais mentions the fine Turkey-leather of Montelimar in Dauphiny.

which

which was to perfect the quality of the skins to be prepared into Turkey-leather.

I went to visit this excellent establishment, where every thing is conducted with an intelligence and method which much interested me. But in the operations which they were pleased to permit me to see, I did not observe any thing which I had not seen practised in other places. It is not improbable, indeed, that they concealed some parts of the process from me, for they did not always reply to my questions; nor could I much disapprove of their silence. The great press, however, which is not shewn to every body, was set in motion before me, and I was made acquainted with all its details.

It is made of iron, and weighs twenty-two thousand pounds. It does not differ from ordinary presses in any other respect than being of a greater size, and having all its parts more perfectly finished. It is usually worked by four men, and produces a very powerful pressure; but when it is required to employ the highest degree of force, two horses are yoked to it.

Skins of different kinds, which in ordinary manufactories would have been thought sufficiently

ficiently dreſſed (that is, which were well preſſed, and diſcovered no remains of the unctuous ſubſtances uſed in preparing them), were wetted and put into the preſs.

The water which oozed from it was collected, and during the laſt ſtrokes of the preſs a thick oil ſwam on the top. This oily matter, ſaid the manager, in time becomes rancid, and acquires an acid quality, which not only alters the colours of the ſkins, and gives them a blackiſh appearance, but alſo corrodes their grain, and the reticulated ſubſtance which gives them conſiſtence; they are thence of little durability. This obſervation appears juſt, and deſerves to be taken into conſideration by thoſe who are engaged in this buſineſs.

As the manufactory is conſiderable, a good deal of oily matter, which would otherwiſe be left, is obtained by this mode, and made into tallow.

CHAP.

CHAPTER IV.

Monument of the Fire of London.—Quakers.—Some Cabinets of Natural Hiſtory.—Sir Henry Inglefield.—Preparations for our Journey to Scotland, and the Iſle of Staffa.

THE ſtairs of the column called the Monument were receiving repairs, which gave me a better opportunity to aſcend it, and to view from the ſummit the city of London and its environs.

This column, which is ſituated at a ſhort diſtance from London-bridge, is of the Doric order, and two hundred and two feet in height, and fifteen feet in diameter. It was erected by the city in memory of the famous fire of 1666; and is conſidered as one of the maſter-pieces of Sir Chriſtopher Wren.

The monument having been already deſcribed by a number of travellers, I ſhould not have mentioned it here, were it not for a particular circumſtance which my viſit to it gave me an opportunity of remarking.

I had

I had begun to aſcend the three hundred and eighty ſteps leading to the upper balcony, when I perceived that the inner rail which winds round with the ſtaircaſe was decayed and unſerviceable. The higher I aſcended the deeper was it decayed; and having reached the platform, I obſerved that the baluſtrade which went round it, though made of iron of a conſiderable thickneſs, was almoſt entirely deſtroyed, particularly in the direction of certain currents of air; ſo as to render it dangerous to approach very near it.

I conceived, indeed, that the vicinity of the ſea muſt occaſion acid vapours, injurious to all the metals, but eſpecially to iron. I obſerved alſo, that the numerous baluſtrades which incloſe a great number of the houſes of London, required frequent painting to preſerve them. But I ſhould never have imagined that the decay could have been ſo rapid, in ſo ſhort a ſpace of time, ſuppoſing even that the railing of the monument had never been repaired ſince its foundation, that is, ſince the year 1666.

In ſeveral towns of the north and ſouth of France, much nigher the ſea than London, I have ſeen vanes of ſteeples, baluſtrades of balconies,

balconies, and iron ringbolts for faſtening veſſels to, of more than two hundred years old, which had not ſuſtained one-fourth part of the damage of the iron-work of the Monument of London.

It is thence to be inferred, that the atmoſphere of this city is impregnated with corroſive emanations more copious and active than elſewhere; and this might, indeed, be expected, where there is ſo great an aſſemblage of inhabitants, who uſe nothing, for common firing, throughout the whole year, but pit-coal, and in a city filled with manufactories and eſtabliſhments of every kind, which conſume ſo many currents of air, and ſuch enormous maſſes of combuſtibles.

I am very far, however, from thinking that the city of London is more unhealthy than other cities, becauſe it has no other firing than pit-coal. For not only do experience and a long train of obſervations prove the contrary, but it is alſo to be preſumed that this immenſe quantity of firing contributes to its ſalubrity; in the firſt place, by the ſtrong, equal, and conſtant heat produced by the pit-coal, in an atmoſphere naturally impregnated with water; and in the

ſecond

ſecond place, becauſe ſo many chimnies, ſo many manufactories and works of every kind uſing fire, occaſion currents and changes of the air on every ſide, which carry off the noxious and peſtilential vapours that always take place when the reſpirable maſs is too long ſtagnant.

With regard to the emanations from the coal while it is burning, they are of two kinds: the firſt are bituminous, and even a little balſamic, and, therefore, rather ſalutary than injurious to the lungs. The ſecond, which are diſengaged when the combuſtible is very ſtrongly burnt, are acid, and conſequently antiſeptic. But the good conſtruction of the chimnies, and the impulſive action of the fire, elevates the column of vapours above the habitations. Then the ſmalleſt wind (and there always blows one at a certain height) removes and diſſipates theſe emanations, which act only on the iron works, particularly the moſt elevated, or on the foliage of trees planted too near the city.

Beſides, the incalculable advantages yielded by the pit-coal, that uſeful combuſtible, on which the exiſtence of England in a

manner depends, are amply capable of compenſating the few ſlight inconveniencies which attend the uſing of it: and though it ſhould put our faſhionables of Paris, like thoſe of London, to the trouble of changing their linen twice a-day, I ſhould wiſh, for the happineſs of individuals, and the general proſperity of my country, that France were as far advanced as England in the general uſe of pit-coal.

Let not thoſe who have only vague notions of the ſubject, ſay that we have neither ſo much nor ſo good pit-coal as is found at Edinburgh, Glaſgow, and Newcaſtle. To convince them of their error, I would only appeal to the opinion of ſeveral intelligent Engliſhmen who have travelled with advantage in France. I ſpeak of philanthropic Engliſhmen, ſuch as Arthur Young, Symonds, Sir W. Hamilton, Lord Greville, and others; for, with reſpect to the Britiſh government, its policy obviouſly requires, that we ſhould long continue ignorant on a point of ſo much importance, and which ſo cloſely intereſts our manufactures and our commerce. I ſhall reſume the conſideration of this uſeful ſubject,

ject, which I quit with regret, when I ſhall have viſited the mines of Newcaſtle.

The Quakers.

I love the quakers, and I am highly pleaſed with them in private, in ſociety, and in their religious aſſemblies. They inſpire me with a ſentiment of involuntary veneration.

Cloathed with all that is moſt ſimple, plain, and modeſt, but at the ſame time, moſt neat, finiſhed, and perfect; it appeared to me that their mind participated in the clear whiteneſs of their elegant linen, and that they were kept as pure, and as void of blemiſh, as their veſtments.

Buffon had juſt reaſon to ſay, that men become, in a manner, identified with their attire, and that it is of much more importance than one imagines, to accuſtom youth to attend to what is called genteel and decent appearance. There is much profound ſenſe in what that illuſtrious man wrote upon this ſubject. He ſaid alſo "When we "form our opinion of a man, we attend to "his phyſiognomy; there is nothing about "him, even to his clothes and head-dreſs,

" which has not ſome influence on our " judgment. A ſenſible man ſhould re- " gard his veſtments as forming part of " himſelf, ſince they are ſuch, in fact, in " the eyes of others, and ſince they oc- " cupy ſome place in the general opinion " which one forms of the perſon who wears " them *." *Hiſtoire Naturelle de l'Homme, page* 520, *in* 4*to*.

The

* A man who was not deſtitute of talents, but who wiſhed at all riſks to act a conſpicuous part at a very early period, I mean Herault de Sechelles, made an excurſion to Montbart, in 1785, to ſee Buffon, who kept him ſeveral days at his houſe, and was pleaſed to ſhew him marks of affability, and even of confidence.

In gratitude for ſo many teſtimonies of kindneſs, Herault, on his return to Paris, made the greateſt haſte to announce that he had filled his journal with anecdotes and curious details, reſpecting the great man whom he had been to viſit; and he read in more than one circle, with a tone of myſtery, this journal, written under the roof of hoſpitality. This compoſition, loaded with the minuteſt details, is an heterogeneous mixture of pompous eulogies, critical remarks, and ſatyrical epiſodes, often ſcandalous and almoſt always falſe. This ſpecies of domeſtic *eſpionnage*, which ſo ſtrongly favours of ingratitude and depraved manners, would, in other times, have driven that man out of every ſociety that had any reſpect for itſelf.

Herault appears to have wiſhed to throw ridicule on Buffon on account of his hair, bleached with the labours of ſixty years, of which he was very careful. He has affected

The places where the quakers aſſemble for worſhip, or rather to meditate, to deſcend into their own thoughts, and to await the inſpirations of virtue in their hearts, are calculated to excite reſpect.

This kind of temples, like thoſe of the people of antiquity, admits the light at the top of the roof only. The walls are of a dazzling white; the wainſcotting, unincumbered with ſculpture, ſhines in the modeſt luſtre of its native colours, and the exquiſite cleanlineſs with which it is kept; the ſeats are ſimple benches, placed in parallel rows. In vain would one look here for paintings, ſtatues, altars, prieſts, and acolothiſts. All theſe acceſſories are conſidered by the quakers as ſuperfluities, de-

affected to ſay, that Buffon cauſed it be dreſſed three times every day in five rows of floating ringlets.

The following is a fact upon this ſubject, which contains ſome more truth, and of which I was a witneſs. Madame de Nanteuil, a woman of great vivacity and beauty, came one day to ſee Buffon at Paris, about eight in the morning, on ſome buſineſs. He was at his toilette; ſhe apologized for appearing in diſhabille before the hiſtorian of nature.—"What," replied Buffon, "are you not already ſufficiently "decorated with youth and beauty. It is at my time of "life that one ought to pay attention to dreſs, in order to "conceal a little the deformities of age."

viſed by human invention, and as foreign to the Supreme Being. They prefer to offer up to him pure hearts, and acts of virtue and beneficence. They are perſuaded that nothing can be more agreeable to him than that mild philanthropy which induces them to regard all mankind as brothers and real friends, with whom they travel, in common, the ſhort, but difficult, road of life, in which they reciprocally ſtand in need of aſſiſtance.

They, accordingly, hold in abhorrence thoſe cruel and ſanguinary perſons, who, from motives of ambition or vengeance, provoke war; that is, who compel or excite men who have no real cauſe of quarrel, to devour and aſſaſſinate each other in cold blood.

When the quakers are aſſembled in their churches, the men occupy a place apart from that of the women, and have their heads covered with a black hat, of a broad half-cocked brim, without loop or button. Their eyes are humbly bent on the ground, and often entirely ſhut, to avoid any interruption in the midſt of their contemplative meditations.

The

The women alſo have their heads covered with bonnets, made of ſilk, velvet, or ſtraw, but very plain. They, in general, conceal their faces; at leaſt they do ſo in this place of ſelf-recollection. Their hair is without powder, but is waſhed and trimmed with ſuch neatneſs, that it forms one of their fineſt ornaments. They are attired in the moſt decent ſtyle; their clothes, however, are generally made of the fineſt and moſt coſtly ſtuffs, though at the ſame time of the graveſt appearance.

At the farther end of the church there is a kind of eſtrade, a little elevated, and ſurrounded with a baluſtrade of wood. It does not reſemble a preacher's pulpit; it has rather the appearance of a large and long roſtrum, to harangue from. Here it is that thoſe who are animated with celeſtial inſpirations, take their place, to communicate in a loud voice to their brethren the tranſports of their ſouls, and the impreſſive ſentiments which they have received from the Eternal.

I often beheld them, in that prophetic ſtate, with a perfect conviction that they were no more inſpired by the breathing of

the Holy Ghoſt, than were the Sybils in the time of the Oracles by the ſpirit of Apollo, or the Somnabuliſts, lately, by the illuſions and ſigns of Meſmer.

But, making a diſtinction between the quakers, who are certainly ſincere in their belief, and the latter, who exhibited nothing but impoſture, I amuſed myſelf with tracing the impreſſions produced on them by the action of the mind, when too long employed in metaphyſical abſtractions. I ſaw ſome who often worked themſelves into a ſtate of giddineſs with intenſe thinking, conceived that they were inſpired, broke the profound ſilence which reigns in their aſſemblies, and mounted the roſtrum.

Then it was that I was excited to view them more cloſely, by the aid of a glaſs. They keep their eyes half ſhut, or bent towards the ground, and ſlowly, and at long intervals, pronounce ſome expreſſions in a ſad and melancholy tone; ſupporting themſelves with their hands ſtrongly preſſed againſt the baluſtrade of the roſtrum, and appearing to make efforts to call forth, and, as it were, to ſeize ideas.

They then ſwing themſelves backwards and

and forwards, and ſometimes in a ſidelong direction; at firſt with a motion ſlow and uniform, and accompanied by ſome words, delivered with a more rapid utterance. Their action ſoon redoubles: this ſtruggle of body and mind impels the blood towards the head; the cheeks redden, ideas croud upon the imagination, expreſſions follow; the whole ſoul and heart are kindled; a ſort of quaking appears, and the orator is inſpired *.

The women in ſimilar circumſtances diſcover pretty much the ſame appearances; they are neither more nor leſs loquacious. Many of theſe diſcourſes are above mediocrity; ſeveral are tolerable, and it is ſaid that ſome are even eloquent; but all of them are favourably received. The ſubject always turns on the duties of man, on the pardon of ſin, and on leſſons of the moſt perfect morality. I heard a female, one day, deliver a very excellent prayer to the Deity. She might poſſibly have prepared it beforehand; though it is not unlikely that her feeling ſoul inſpired her ex-

* It is this which has procured them the name of *quakers*.

tempore

tempore with that fine emotion of love and gratitude. The female ſex will always be able to give us leſſons in this reſpect.

There ſometimes happen meetings at which no perſon ſpeaks. This might be expected among men of worth, who are happy in their own conſciences, and more accuſtomed to put morality in practice, than to cry it up in words. As with them there are no diſcourſes pronounced by a ſuperior, or paſtor, who governs his flock at pleaſure, the only rule obſerved in that reſpect is, never to ſpeak but from the impulſe and tranſport of the heart. But as theſe depend upon an ardent mind, and a ſtrong imagination, liable to be acted upon by phyſical cauſes, which muſt vary according to the ſeaſon, the ſtate of the air, or health, it follows that the thermometer of the head, no leſs ſenſible than that of art, muſt ſometimes be found in a ſtate of reſt and ſtagnation.

But what ſeems to diſtinguiſh this ſimple worſhip from many others is, that experience has proved that it conducts men to the practice of their duties without fortifying them by vain ſuperſtitions; that it makes virtue amiable, by preſenting her under attractive

tractive forms; and that men of this claſs are valuable to a government, by the good examples which they exhibit. Happy in their acts of virtue, rich, in general, from their application to induſtry, they furniſh the ſtrongeſt proof that the morality of individuals, by creating private happineſs, gives exiſtence to public proſperity.

Some Cabinets of Natural History.

Mr. Drury's cabinet of inſects muſt have been formed at a great expence, and it muſt have required much time, and many fortunate opportunities, to collect ſo many objects of this nature, brought from the Eaſt-Indies, from China, Japan, the South Sea, &c. Every thing is arranged, in this collection with much care and great neatneſs.

Smeathman, who had travelled in Africa, and who brought home ſeveral curious inſects to Mr. Drury, with whom he was particularly acquainted, procured me admiſſion to this cabinet. This recommendation was of ſo much uſe to me, that Mr. Drury had the complaiſance to ſhow me his collection in its minuteſt detail, and with much affability.

I knew

I knew, and was poſſeſſed of, his excellent work, entitled, *Natural Hiſtory of Inſects, claſſed according to their different Kinds, in Engliſh and French (3 vols. in 4to. with coloured plates; 1770, and following years).* I ſaw, therefore, with much intereſt, the inſects which were delineated in this book.

I paſſed alſo ſome hours very agreeably in the cabinet of Mr. Thomas Sheldon, brother to the anatomiſt. It contains South-Sea ſhells, and other intereſting marine productions.

I infinitely regret my not having ſeen the rich collection of Lord Greville, the relation of Sir William Hamilton, ambaſſador at Naples; but they had a little before ſet off together for Scotland, with the intention of viſiting the Iſle of Staffa.

I was alſo deprived of ſeeing the ſcientific collection of Lord Bute, as well as that of Dr. Pearſon; neither of them being in London at the time.

Sir Henry Inglefield compenſated theſe privations by the civilities and kindneſſes which he heaped upon me, during my ſtay in that city. He has ſucceſsfully applied himſelf to the ſtudy of aſtronomy and natural philoſophy; he is an agreeable companion,

panion, full of affability and worth, and gives a hearty welcome to ſtrangers. I ſincerely wiſh to have the pleaſure of ſeeing him in France, to repay with heartfelt gratitude the civilities I received from himſelf and his reſpectable mother.

If all Engliſhmen were endowed with ſuch urbanity, it would be unjuſt to reproach them with that neglect and coldneſs which they are accuſed of ſhowing towards thoſe who have given them the beſt reception in France. This accuſation, however, is exaggerated; and I have more than one proof that there are many exceptions to it.

As I intended to take advantage of the remainder of the good ſeaſon, to perform my journey to Scotland and the Hebrides, I was buſied for ſeveral days in making the neceſſary preparations for my departure.

Several learned characters were pleaſed to give me letters of recommendation to perſons in Edinburgh and Glaſgow, and to the Duke of Argyle, who was then in one of his eſtates in the north of Scotland, on the road which I had to take to the neareſt point of embarkation for the Hebrides.

CHAP-

CHAPTER V.

Departure for Scotland.— Itinerary.— Obſervations of Natural Hiſtory.

COUNT Paul Andreani, of Milan, William Thornton, M. de Mecies, and myſelf, ſet off from London at ſix in the evening, in three poſt-chaiſes; two of which were occupied by ourſelves, and the third by our ſervants.

I had been acquainted with Count Andreani at Paris; he loved the ſciences, and had made a conſiderable aeroſtatic experiment at Milan, at his own expence; he went up in a large balloon, which he cauſed to be conſtructed on the plan of Montgolfier.

William Thornton is a very worthy and intelligent American, who, after proſecuting his ſtudies, with advantage, under Doctor Cullen, at Edinburgh, had come to finiſh them at Paris, where he conceived a taſte for natural hiſtory. The journey could not

but

but be very agreeable with ſuch companions.

M. de Mecies, of London, had been introduced to us a few days before our departure from London, by Mr. Thompſon, a very good naturaliſt, as a ſtudious young man, who was much attached to mineralogy; we admitted him, with pleaſure, into our party.

We loved to aſſociate with perſons who poſſeſſed the ſame taſte with ourſelves, and who were not afraid to participate in the fatigues and dangers of the tour which we meant to purſue as far as the iſle of Staffa, if the ſeaſon ſhould permit us to riſk ourſelves on the tempeſtuous ſea which ſurrounds it, and which is ſcattered over with iſlands and dangerous currents.

Itinerary.

From London to *Barnet*, twelve miles.—A ſuperb road, covered with carriages, and with people on horſeback and on foot, who were returning, with a fine moonlight evening, to London, from the country-houſes and neighbouring villages, where they had been to recreate themſelves during Sunday.

The

The air was ſo ſerene, and the night ſo delightful, that we reſolved to profit by it in continuing our progreſs.

Hatfield, nine miles.

Stevenedge, twelve miles. — We arrived there at four in the morning, and repoſed ourſelves till nine. The inn is excellent, but very dear.

Dugden, ſixteen miles.

Stilton, fourteen miles.

Nothing can ſurpaſs the beauty and convenience of the road during theſe ſixty-three miles; it reſembles the avenue of a magnificent garden.

At Stilton, we firſt began to obſerve, on the ſides of the road, large heaps of ſtones, deſtined to repair it with.

Theſe ſtones are calcareous, and of a greyiſh colour. They contain a number of petrified marine ſhells, among which I diſtinguiſhed a kind of *concha exotica*, and others of a more common ſort. In theſe ſtones, alſo, by the ſide of the ſhells, may be ſeen ſubſtances, which plainly appear to be pieces of wood, but which are difficult to be preſerved, becauſe being of a pyritous nature, they are eaſily decompoſed by the air. They

are

ear of a black colour, and ſome bituminous parts may be diſtinguiſhed in them of greater ſolidity.

On leaving the village of Stilton, I obſerved, at the door of the laſt houſe, on the right, in the way to Stamford, a ſort of ſeat of unhewed ſtone, conſiſting of a block of real volcanic baſſaltes, mixed with ſome ſmall cryſtals of black *ſchorl*, and ſpecks of volcanic chryſolite. I aſked ſeveral perſons whether they knew whence that ſtone had been taken; but was able to procure no other information than that it had always been ſeen in its preſent place, and that they did not know whence it had been brought. As it weighs, however, two hundred weight at leaſt, and as it is probable that it will not be removed for a long time, I invite the Engliſh naturaliſts, if there be any in the vicinity of Stilton, to endeavour to diſcover the place where this volcanic ſtone was procured, and to examine whether it has not been carried from the neighbouring mountains.

From *Stilton* to *Stamford*, fourteen miles.—There are two old churches at Stamford, which are worthy of being examined. Their

conſtruction is of a ſolid, but, at the ſame time, bold and elegant appearance. The architecture is in the Gothic ſtyle; and the execution is ſuch as leaves nothing to be found fault with.

Wintham Common, eleven miles.

Grantham, ten miles. — A ſuperb inn, where every thing bears the appearance of exquiſite neatneſs.

Newark, *South Muſcomb*, *Tuxford*, fourteen miles.—The road leſs agreeable, lying through common paſture-grounds, a little marſhy. In ſome parts, however, there may be obſerved, under the turf, beds of black calcareous ſtone, foliated in pieces of from half an inch to four inches thick. This ſtone, when rubbed with iron, emits a ſmell like that of burnt corn. There are found in it terebratulæ, and other ſmall ſhells.

Barnby Moor, ten miles.

Doneaſter, fourteen miles. A handſome little village. It was not long ſince a balloon had been ſent up here, filled with rarefied air, in the manner of Montgolfier's. I ſaw an account of it in a bill affixed to the gate of the inn for letting poſt-horſes.

Ferry-

Ferrybridge, fifteen miles.—A continuation of common paſturage from Barnby Moor to Ferrybridge, covered with numerous flocks of ſheep, and black cattle. The ſoil below conſiſts of ſmall gravel, in ſome places covering ſmall beds of calcareous ſtone. On approaching Ferrybridge, the country becomes mountainous, and conſiderable banks of grey calcareous ſtone are ſeen. At Ferrybridge there is a good inn for poſt-horſes.

Brotherton, *Fairburn*, *Micklefield*, *Aberford*, *Bramham*, *Weatherby*, *Walſhfordbridge*, *Allerton-Park*, *Boroughbridge*, *Diſhford*, *Topcliff*, *Surſhbyſtoop*, *Sandhulton*, *Southoltungton*, *North Allerton*—preſent the ſame order of things, with very little difference. The road ſtill ſufficiently convenient, but not ſo good as before—the landſcape a little wilder—ſome parts better peopled, but worſe cultivated.

The face of the country is interſected at North Allerton with hills, conſiſting, for the greater part, of large, round, flint ſtones, or, at leaſt, covered over with them. At intervals, however, and in the hollows, there appear ſome ſtrata of calcareous ſtone, of a greyiſh white, but of an indifferent quality.

It is, notwithſtanding, employed with advantage as a manure, when converted into lime.

The round blocks of ſtone, which cover the moſt of theſe calcareous hills, preſent a new face of things. They conſiſt of *granites*, greeniſh *petroſilices*, and a number of black *trapps*, which it would be difficult for one who has not been very much accuſtomed to ſtones of this kind, to avoid confounding with compact volcanic lavas.

Louſamehill, Little Smeaton, Dalton, Croft, Darlington.—On leaving the little town of Darlington, we ſaw on the ſide of the way conſiderable heaps of black *trapps*, which had been brought from ſome places in the neighbourhood, to keep the road in repair.

Cottonmundhill, Aycliff, Woodham, Ferryhill, Sunderland-Bridge, Durham.—The laſt a ſmall city, which is the ſee of a biſhop, and placed in a delightful ſituation; it has a ſuperb Gothic cathedral.

Durrowmoor.—There we firſt obſerved the traces of a vein of coal, which were diſcovered in calcareous ſtone, of bad quality, and a little mixed with clay.

Paulſworth, Cheſter-le-ſtreet, Pelaw Birtley, Gateſhead.—There are coal-mines worked at Gateſhead.

New-

Newcaſtle.—From Ferrybridge to Newcaſtle is reckoned ninety-ſix miles. We made this long journey in one day; having left Ferrybridge, where we had paſſed the night, at five in the morning, and arrived at Newcaſtle at nine in the evening.

About four in the morning, of the 30th of Auguſt, when advanced about ſeventy miles on our way from London, we began to feel the weather cold and penetrating, though it was at the ſame time calm and ſerene, and the air quite pure. I inſpected my thermometer, and found it half a degree above the freezing point; I ſaw ice, alſo, of about half a line thick. At the ſame hour of the following day, the mercury was ten degrees higher, and continued ſo almoſt the whole day.

On the ſecond day, it was fifteen degrees above the zero of Reaumur's thermometer, and the cold was no longer felt. This ſhews a very great inequality of temperature at that ſeaſon in England, where the winter is a little longer and more foggy than at Paris; but where it is not ſo cold, on account of the vicinity of the ſea.

CHAPTER VI.

Newcaſtle.—Its Manufactures.—Its Coal-mines.

NEWCASTLE is ſituated on the beautiful river Tyne, which is covered with veſſels, and bordered on the right and left with manufactories of every kind, down as far as its mouth, which is about ten miles from the city.

I remained in Newcaſtle long enough to enable me to pay due attention to its numerous coal-mines, and the multiplied produce of its moſt active induſtry.

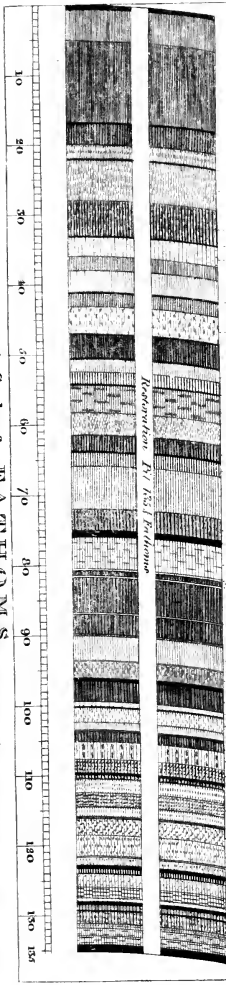
Mr. David Crawford, who was the friend of William Thornton, one of my fellow-travellers, procured us opportunities of examining the mines, and ſeveral manufactories: he did us this ſervice in the kindeſt manner, for he loved natural hiſtory and the arts himſelf, was very communicative, and anxious that we ſhould ſee every thing that was curious; he was the proprietor of a manufactory, in which gold and ſilver are extracted

SECTION of the STRATA, to the LOW MAIN COAL,

At St. Anthon's Colliery,

near Newcastle upon Tyne.

The Property of George Johnson Esqr. & Co.



A Scale of FATHOMS.

	Fath.s	Feet	In.s
Soil & Clay	5		
Brown Freestone	12		
Coal			6
Blue Metal Stone	2	5	
White Girdles	2	1	
Coal			8
White & Grey Freestone	6		
Soft Blue Metal Stone	5		
Coal			6
Freestone Girdles	3		
Whin	1	4	6
Strong Freestone	3	1	
Coal		1	
Soft Blue Thill	1	5	
Soft Girdles mixed with Whin	3	5	
Coal			6
Blue & Black Stone	3	4	
Coal			8
Strong Freestone	1	3	
Grey Metal Stone	1	4	8
Coal			
Grey Post mixed with Whin	4	1	
Grey Girdles	3	1	
Blue & Black Stone	2	2	
Coal		1	
Grey Metal Stone	2		
Strong Freestone	6		
Black Metal Stone with hard Girdles	3		
HIGH MAIN COAL	1		
	76		
Grey Metal	4	3	
Post Girdles		2	
Blue Metal		4	
Girdles		1	2
Blue Metal Stone	5		
Post		1	
Blue Metal Stone	3		
Whin & Blue Metal		1	6
Strong Freestone	3	3	
Brown Post with Water			7
Blue Metal Stone with Grey Girdles	2	2	
Coal		3	
Blue Metal Stone	3		3
Freestone		4	
Coal	2		6
Strong Grey Metal with Post Girdles	1	1	
Strong Freestone		1	
Whin	1	2	7
Blue Metal Stone		1	
Grey Metal Stone with Post Girdles	2	4	5
Blue Metal Stone with Whin Girdles	1	4	3
Coal		3	6
Blue Grey Metal	2		7
Freestone			
Freestone mixed with Whin	2		
Freestone	1	2	
Dark Blue Metal & Coal		2	2
Grey Metal Stone & Girdles	2	2	
Freestone mixed with Whin	3		7
Whin	1	1	6
Freestone mixed with Whin		3	3
Coal		3	10
Dark Grey Metal Stone	1	4	
Grey Metal & Whin Girdles	1	3	
Grey Metal & Girdles	1	3	
Freestone		3	2
Coal		4	
Blue & Grey Metal	2		9
Coal			9
Blue & Grey Metal	2		6
Freestone mixed with Whin		4	6
Grey Metal	1		9
Grey Metal & Girdles	1		6
LOW MAIN COAL	1		
Total	135	1	6

tracted from the cinders uſed in the furnaces of the workers in theſe metals, and alſo from their old crucibles: he purchaſes theſe rude materials in Holland, England, and France.

But it is remarkable, that the cinders brought for this purpoſe from France, are ſuch as have already paſſed through the hands of refiners, who uſe only waſhing and other imperfect proceſſes, by which means they recover only a part of the precious metals. In Newcaſtle, however, the abundance and the cheapneſs of coal enables the manufacturer to extract the gold and ſilver, by fuſion, in reverberating furnaces, which are very ingeniouſly conſtructed.

I ſaw, with much intereſt, the manufactory of Mr. Crawford, where he has erected other furnaces for the revivification of the calx of lead and copper. He procures the materials for this operation from different parts of Europe, by purchaſing old leaden pipes, which have remained long under the ground, copper which has been corroded by ruſt, and old cannon.

We ſaw ſeveral glaſs-houſes, where window-glaſs, bottles, decanters, drinking-glaſſes, &c. were made. All theſe manufactures,

though eſtabliſhed in buildings of a mean appearance, are managed with a ſimplicity and an economy which cannot be too much praiſed.

This modeſt ſimplicity is of great advantage to the country; it encourages active and induſtrious men to embark in trade, who would otherwiſe be unwilling to form large eſtabliſhments, being alarmed by the expences which extenſive works require, when conſtructed on a magnificent ſcale.

It is a taſte for pomp and grandeur which almoſt always ruins the manufactures of France, and prevents thoſe new ones which we want from being eſtabliſhed: men are afraid to involve themſelves in ruinous expences for mere warehouſes and workſhops.

It muſt be acknowledged, that the Engliſh and Dutch are much more prudent, and exhibit examples in this way, which we ought to imitate. Architecture is a part in eſtabliſhments of this kind.

This beautiful river, the Tyne, is rendered highly intereſting by the number and variety of the manufactures carried on upon its banks. On one hand are ſeen brick-fields, potteries, glaſs-houſes, and chymical works,

for

for making ceruſe, minium, vitriol, &c.; on the other, manufactories in iron, tin, and every kind of metal; machines for making braſs-wire, plate-metal, &c.

This multitude of eſtabliſhments, riſing oppoſite to one another, diffuſes every where ſo much activity and life, if I may uſe the expreſſion, that the eye is agreeably aſtoniſhed, and the ſoul feels a lively ſatisfaction in contemplating ſuch a magnificent picture. Humanity rejoices to ſee ſo many uſeful men finding eaſe and happineſs in a labour which contributes, at the ſame time, to the comforts and enjoyments of others; and, in the laſt reſult, to the proſperity of the government, which watches over the ſafety of all.

Compare this honourable induſtry with that diſgraceful indolence and diſguſting miſery which is to be ſeen in Roman Catholic countries, where pernicious laws permit a great portion of the population to be buried in monaſtic inſtitutions, and it will ſoon be diſcovered how much government and religion influence the happineſs of mankind.

The numerous coal-mines in the neighbourhood

bourhood of Newcaſtle form, not only immenſe magazines of fuel for the reſt of England, but are alſo the ſource of an extenſive and profitable foreign commerce.

Veſſels loaded with coal, for London and different parts of Europe, ſail daily from this port. Beſides this commerce, the navigation which reſults from working theſe mines, gives an incalculable advantage to the Britiſh navy. The coal-trade, as it is called, forms a great nurſery of ſeamen; and, in the time of war, more than a thouſand coal veſſels have been armed, as letters-of-marque, and done conſiderable injury to the enemies' commerce.

In this practical ſchool of ſeamenſhip, men accuſtomed to every danger are to be found. The celebrated Cook began his naval career, as a ſailor, in the coal-trade; his enterpriſing and active genius ſoon raiſed him to the command of a veſſel. He afterwards purchaſed a ſhip on his own account, and diſplayed ſo much ſkill and courage in the midſt of the greateſt dangers, when he, as it were, ſubdued the elements, that though yet young, he acquired a very high reputation among his brother ſeamen. He afterwards entered

entered into the royal navy, where he received, from the Britiſh government, that encouragement which he ſo juſtly merited. This aſtoniſhing navigator ſailed three times round the world, and enriched geography, natural hiſtory, and navigation, with great and valuable diſcoveries. The modeſt habitation where he was born, in the neighbourhood of Newcaſtle, is preſerved with pious veneration.

The coal-mines, in the neighbourhood of Newcaſtle, are covered with a ſoil which yields fine paſture and the richeſt products of agriculture. Under this fertile ſoil there is found a freeſtone, of an excellent quality, for grind-ſtones. This ſecond richneſs of the earth forms another extenſive object of trade for the induſtry of the inhabitants of Newcaſtle: theſe ſtones have ſo great a reputation, that they are exported to every part of Europe.

The firſt mine I viſited belonged to a private individual; it was ſituated about two miles from the town, and required one hundred men to work it; of whom thirty were employed above ground, and ſeventy in the pit: twenty horſes were kept in this profound

profound abyſs, for drawing the coal through the ſubterraneous paſſages to the bottom of the opening of the pit, four worked the machine which raiſed the coal, and ſome more were employed in auxiliary labours.

The following is the order of the mineral ſubſtances, as they appear in deſcending to the coal:

	Feet.
Vegetable earth, of good quality - - - - - -	2
Beds of rounded calcareous ſtones, intermixed with rounded pieces of freeſtone - - - - - -	15
Grey clay, more or leſs pure - - - - - - -	16
Hard quartzoſe freeſtone, with lamellæ of mica	25
Very hard black clay, ſomewhat bituminous, intermixed with ſome ſpecks of mica - - - - -	26
Black clay, more bituminous, and partly inflammable; when the foliations of this clay, which ſeparate with facility, are examined with attention, ſome prints of fern appear, but they are ſcarcely diſcernable - - - - - - - -	18
Total	102

At this depth of one hundred and two feet the coal is found. The bed is five feet thick in ſome places, and leſs in others; but in general it is eaſily wrought, and large pieces are brought up. This laſt circumſtance is of conſiderable advantage, as theſe pieces are moſt proper for chamber-fires, and eaſily tranſported;

tranſported; which makes this kind of coal ſell at a higher price.

When the bed of black and bituminous clay is penetrated, the coal is found adhering to it; but this is not always the caſe, for there are other mines in the neighbourhood where freeſtone is the covering, which in the points of contact is mixed with the coal to the thickneſs of two or three inches; the latter running as it were in ſplinters into the ſtone, and having a ligneous appearance when attentively examined.

This mine had a large ſteam-engine for carrying off the water, and working a ventilator to purify the air.

The machine which raiſes the coal from the pit is very convenient, and is worked with ſtout horſes. The buckets, in which it is brought up, are not of wood, but of oſier, ſtrongly made. They contain at leaſt twelve hundred weight of coal each; and as the one aſcends while the other deſcends, one of them arrives at the mouth of the pit every four minutes. When one of theſe baſkets comes up, a ſingle man receives it; and while it is yet ſuſpended, places it upon a dray drawn by one horſe. He then unhooks the baſket,

puts

puts an empty one in its place, and conducts the dray to a ſpot ſomewhat elevated at a ſhort diſtance, and where ſome boards are erected in the form of a ſhed. He empties the baſket on this kind of ſhed; the duſt paſſes through holes, while the large pieces of coal rolling down the inclined plane, fall upon the ground in heaps on the outſide of it. Waggons, which I am about to deſcribe, then take it up, and carry it to wharfs on the river-ſide, where the veſſels are loaded.

It might be expected that it would require a great number of horſes and men to tranſport the vaſt quantities of coal deſtined for embarkation, and that this operation would occaſion an immenſe expence. But art has ſupplied the place of horſes, and even rendered them unneceſſary. The following is the ſimple and ingenious manner in which this uſeful improvement is effected.

Roads which have an almoſt inſenſible inclination are formed with the greateſt care, and prolonged to the place where the veſſels are loaded. The length of theſe roads is frequently ſeveral miles.

This firſt operation being finiſhed, two parallel lines are traced along the road, at the

the exact distance which separates the wheels of the waggons destined to transport the coal. Logs of hard wood are then laid along these two parallel lines, and firmly fixed in the earth with pins.

The superior surface of these logs are carefully cut into a kind of moulding, which is well rounded, and projects upwards. The thickness of this elevated ledge must correspond with the width of the groove in the waggon-wheels, which are made of cast-iron, and hollowed in the manner of a metal pulley.

These wheels are completely cast in one piece, in a mould from which the rim comes out hollowed. This large groove is several inches deep, and of a proportional width; so that the wheel exactly encases the projecting part of the log, from which it cannot slide in any direction. As the moulding is well greased and polished by continual friction, large four-wheeled waggons, containing eight thousand weight of coal each, move along the inclined plane, by the laws of gravity, and proceed as it were by magic in the rear of each other, until they reach the river. Arrived there, a strong wooden platform,

form, which projects above the water, adds several fathoms to the length of the road. This timber-work is very strong and ingeniously constructed, and sufficiently elevated, to permit the vessels that take in the coals to pass below it. A man who is stationed on the platform opens a hatch, and a large wooden tunnel presents itself, directed towards the vessel, the hatches of which are open. When the waggon comes to the trap in the platform, its bottom is opened, and all the coal runs in a moment through the tunnel into the vessel. The waggon being emptied, returns by a second road parallel to the first. Other waggons follow the same course after having been in this manner relieved of their contents; and in a short time the vessel is completely loaded. A few horses serve to bring back the empty waggons to the pit, and they soon return with a new load of coal. This ingenious contrivance is as expeditious as economical, and soon indemnifies the proprietors for the money they advance in constructing these roads.

I have here given but a rapid sketch of these extraordinary roads, which are varied in several manners. It would require me to enter

enter into details which might prove too long, and ill-ſuited to the nature of this work, were I to deſcribe all the ingenious means which art and induſtry have employed in conſtructing works of this kind. Where local circumſtances permit the improvement, it has been contrived to combine the weight of the load, and the accelerated movement in ſuch a manner, that files of waggons proceed down one inclined plane towards the place where they are unloaded, and return to the coal-pit empty, and without the aſſiſtance of horſes, along another road parallel to the firſt, inclining in a contrary direction.

The great economy produced by theſe ingenious contrivances, which ſave the expence of employing a multitude of men and horſes, enables the Engliſh to ſell the coal which they export in ſuch abundance to all our ports on the ocean and the Mediterranean, at a lower price than it can be afforded from our own mines, in all caſes where we have to bring it more than three or four miles by land. Marſeilles affords an example in point. This town, which conſumes immenſe quantities of combuſtible matter in

its great ſoap manufactories, is within four or five leagues of a great number of coal-mines. This coal is indeed of an indifferent quality, but it is notwithſtanding employed with advantage in the furnaces of ſoap-works. Would any one believe that the excellent coal of England, which laſts double the time, and gives double the heat, when ſold duty free in the port of Marſeilles, is cheaper than the former. Such inſtances as this ought doubtleſs to give us very important leſſons.

The induſtry of the inhabitants of Newcaſtle is ſo active, that they are accuſtomed to apply it to every object that preſents itſelf. They have even turned to their profit the pyrites, which injures the quality of the coal, but which is found in great abundance in ſome of the mines. The pyritous ſubſtances are carefully ſeparated from the coal; and the expence which this labour may occaſion is repaid with uſury by the vitriol which they produce. The proceſs by which the vitriol is extracted is at once ſimple and economical, and does honour to the intelligence of thoſe who firſt put it in practice.

A large

A large area of ground is incloſed, to which a gentle but ſenſible declivity is given. The ſurface is made quite equal, and covered with a fat clay, which is every where extended and ſmoothed as if it were plaſter, in order to prevent the water from filtrating into the earth. At the ſame time a furrow is formed in the midſt of the area, calculated to collect all the water in one point, and to convey it to a reſervoir.

The area being thus prepared, the pyritæ are ſpread all over its ſurface in layers one above another, to the height of ſeveral feet, and care is taken in placing the different pieces to leave intervals for the admiſſion of the air.

This maſs of pyrites, expoſed to the air, the viciſſitudes of the atmoſphere and the ſeaſons, ſoon heats, ſwells, and is converted into powder. The operation is accelerated by occaſionally turning the pyrites with rakes that have long iron teeth, by which means new ſurfaces are preſented to the air.

In ſummer, when there is no rain, it is frequently neceſſary to ſprinkle the maſs of pyrites with water. This anſwers two pur-

poſes ; firſt, to waſh away the ſalt which is already formed ; ſecondly, to produce by the humid warmth a kind of fermentation in the pyrites, which occaſions a prompt decompoſition : gentle ſhowers are therefor excellent for forwarding this operation. Finally, the water which is loaded with vitriol finding a clay bottom, which prevents it from loſing itſelf in the earth, flows down the inclined area, and falls into a reſervoir, where it clarifies. The natural evaporation which takes place adds to its ſtrength ; and when it is conceived to be properly prepared, it is drawn off into a ſecond reſervoir, attached to the work-houſes of the manufactory : from thence it paſſes into coppers. It is then made to boil, and evaporate by a large fire, formed of the moſt inferior kind of coal ; and when the liquid is brought to a proper ſtate, it is cryſtallized by the operation of cold in wooden troughs. Two or three men are ſufficient to manage a manufactory of this kind, and to make a conſiderable quantity of copperas.

France formerly laid out a great deal of money for this martial vitriol. The dyers of Rouen, Paris, Lyons, and Marſeilles, conſumed

conſumed vaſt quantities of it; but they now procure it nearer home, ſince there have been eſtabliſhed at Alais, in Languedoc, two manufactories, which make this ſalt almoſt in the ſame manner as thoſe of England. It ought to be obſerved, however, that the French copperas is not extracted from coal, but from a very deep vein of grey limeſtone. Eſtabliſhments of this kind may be increaſed to a great extent in France, which abounds with pyrites in many places; but care ought to be taken to erect them in the neighbourhood of wood or coal, and above all, near rivers, that the advantage of water-carriage may be obtained.

The common opinion, that the Engliſh copperas is better than that of France, is mere prejudice. There is no difference between them when they are made with equal care. It is to be wiſhed that we ſhould relinquiſh a number of errors of this kind, which are founded ſolely in habit and cuſtom, and are always injurious to the intereſt and commerce of a country.

The great quantity of coal-duſt collected at the numerous pits in the neighbourhood of Newcaſtle, would ſoon become a great

incumberance, were it not that an admirable method has been fallen upon to prevent the inconvenience, by preparations as ſimple as ingenious. Coal in this pulverized ſtate is not proper for chamber fires, becauſe it falls through the bars of the grate, and extinguiſhes the fire. It is fit only for glaſs-houſes, lime, or brick-kilns, forges, &c. The conſumption for theſe purpoſes is indeed very conſiderable, but is not nearly equal to the quantity produced by the pits, notwithſtanding the great care that is taken to break the coal in large pieces: beſides ſome kinds of coal are liable to crumble into powder, upon receiving the leaſt ſhock: means have therefore been ſought to render this coal proper for grates.

At Liege this kind of coal is mixed with clay, and kneaded into balls, or a ſort of bricks, which when dried are hard, and may be uſed in ſtoves, and even in grates. This a pretty good method, but it is only ſuited to a country in which labour is cheap; ſuch as Brabant, where the coal is thus prepared by women, accuſtomed from their youth to perform this diſagreeable buſineſs.

A ſimilar

A ſimilar method would not anſwer in a rich country, abounding with coal-mines, and where the means employed for facilitating the working and the carriage of the coal are upon the moſt extenſive ſcale; beſides a fuel which every moment covers the hearth with earthy cinders and duſt, would ill accord with the eaſy and comfortable ſituation of individuals in England.

It was therefore neceſſary to ſeek for a method more reconcileable to the habits of the people, and to the price of labour in this country.

That property, which belongs to the beſt kind of coal, of agglutinating and forming a ſingle maſs, when in a ſtate of combuſtion, naturally excited the idea of endeavouring to conſolidate, by means of a great fire, conſiderable quantities of this coal-duſt.

It appears that Becher, a German chymiſt, gave the firſt hint to the Engliſh on this ſubject, ſo far back as the year 1682. He not only propoſed to remove the diſagreeable ſmell of the mineral coal, by converting it into a ſubſtance reſembling charcoal, but to extract from it by the ſame operation a kind of tar, which he regarded

as ſuperior in quality to that of Sweden. He informs us himſelf that he made very favourable experiments to this effect in England *. But on another occaſion I have ſhewn, that though the proceſs uſed by Becher was very ingenious, it preſented many difficulties in the execution, and could not be carried into practice upon a large ſcale: beſides it would cauſe a great waſte of coal.

Since that period, more ſimple and expeditious means have been diſcovered. The coal-duſt is put into a kind of kiln, which is in the firſt place well heated with large pieces of coal. The duſt then coagulates, and runs into a maſs, without loſing any thing except its bitumen. When the ignited maſs is completely red, large pieces of it are pulled out with iron rakes, and laid on the ground, which they ſcarcely reach before they are extinguiſhed. Theſe pieces are firm, though porous, and are excellently

* See the German work by Becker, entitled *Narriſche Weiſheit, und Weiſe Narrheit* (Fooliſh Wiſdom and Wiſe Folly), printed at Frankfort in 1683, in 12mo. See alſo the "Eſſay on Coal-tar, &c. preceded by Enquiries on "the Origin of Coal, and the different Kinds of that "Mineral," which I publiſhed in 1790.

adapted,

adapted, not only for chamber-fires, but what is much more important, for ſmelting iron ore, in high furnaces. This ingenious contrivance has given birth to ſeveral new branches of induſtry and commerce.

The coal thus prepared is called in England *coke*, and is uſed in a great number of manufactories, as a ſubſtitute for charcoal, to which it is in moſt inſtances ſuperior; producing a ſtronger, more equal, and longer continued heat.

Similar means for condenſing coal-duſt have been uſed in France, where it is formed into a ſubſtance almoſt the ſame as charcoal: ſome advantageous improvements have alſo been made upon the Engliſh mode of preparation.

The coal thus prepared is called in France *purified coal*, or *dephlogiſticated coal*. The city of Paris uſes great quantities of it, which are prepared at Moulins in Bourbounois, at Saint-Etienne in Foreſt, &c. and which are tranſported by water upon the Loire, the Allier, the Canal de Briare, and the Seine. This admirable means of preſerving our great and valuable foreſts is much more effectual than a thouſand of

thoſe

thoſe laws and regulations which are repeatedly made, but which tend only to their deſtruction.

The city of Lyons has likewiſe an excluſive eſtabliſhment of this kind, ſituated near the point of Æneas *, and the purified coal prepared at Saint-Chaumont and Rive de Giers is uſed in the copper-works of Saint-Bell.

But, thanks to the government, and to a rich and enterprizing Company, an iron foundery, which will ſoon rival the beſt works of that kind in England, is eſtabliſhed at Creuzot, near Montcenis, in Burgundy: though the place in which it is erected was originally ſterile and ſolitary, it is now covered with habitations. The abundance of coal, the ſimple mode of preparing it as a ſubſtitute for wood, and the models furniſhed by the ingenious Wilkinſon, have performed wonders, and have given birth

* Since the commencement of the revolution not one buſhel of *purified coal* has been brought to Paris. The trees of our fineſt foreſts are daily reduced to aſhes. The eſtabliſhments of Moulins, Lyons, and Rive de Giers, have diſappeared, and the worthy men who erected the foundery of Creuzot, have almoſt all been condemned to moiſten the earth with their blood.

to

to an eſtabliſhment which is truly worthy of a great nation.

This ſhort ſketch is ſufficient to demonſtrate the numerous and incalculable advantages which this uſeful mineral preſents to mankind.

The ſituation of France makes me inſiſt with more earneſtneſs on this truth. A country ſo extenſive, with a population ſo numerous, muſt, when its foreſts are conſumed, reſort to another kind of fuel. Fortunately this vaſt country poſſeſſes innumerable mines of coal, the greater part of which have not yet been opened, and the fine rivers which interſect our territory afford every facility for the formation of canals. It is full time that we ſhould turn our attention to this efficacious reſource. To individuals it would give comfort and happineſs, and to the government it would prove an inexhauſtible ſource of proſperity and power.

I was one day with Benjamin Franklin at Paſſy: ſeveral learned Americans, who were profoundly acquainted with the political and commercial ſtate of England, were of the party. I ſhall not name them, becauſe

cauſe they have, ſince that period, appeared in diſtinguiſhed characters; but I heard them, with pleaſure, point out the real cauſe which renders England ſo wealthy and powerful—a cauſe which has eſcaped the obſervation of almoſt all politicians. "It cannot be doubted," ſaid one of them, "but that it is the coal-mines which perform ſuch wonders: we know that it is a ſort of *leze-nation* to ſay ſo in France, where the coal is as plentiful and as good as in England; but the French nation has ſecured the liberty of the United States; and beſides I wiſh to ſee the people of every country happy. I have travelled much in Italy and in France, and when I paſſed through the latter country, in the midſt of winter, I obſerved, with ſorrow, that the inhabitants of ſeveral provinces were in the greateſt diſtreſs, on account of the want of fuel. The effect of the cold was ſuch, that whole families were compelled to retire to their beds, where they remained in a ſtate of torpor, unable to labour, and conſuming, in a few days, all their little ſavings. How different is the ſituation of labourers

in

" in England, where the winters are much " longer, though leſs ſevere, than in the " north of France! The Engliſh peaſant, " placed beſide a good fire, which, at the " ſame time, lights and warms his cottage, " finds himſelf happy and comfortable. " The father prepares his implements of " huſbandry for the enſuing ſpring; his " ſons aſſiſt him; his daughters ſpin wool " or cotton; the mother manages the fa- " mily affairs; and as the blazing fire is kept " up during the whole night, their labour " is prolonged, in defiance of the climate. " In their manufactories, whether in town " or in country, the ſame activity prevails. " The artizan never ſuffers from cold, and " is, therefore, exempt from almoſt all the " diſeaſes of winter: thus, that ſeaſon, " which is, in general, ſo fatal to the in- " duſtry of other countries, does not dimi- " niſh the labour of the Engliſh people; " and the neceſſary conſequence of a great " maſs of population, conſtantly employed " in purſuits of commerce and manufac- " tures, is an increaſe of wealth, equally " advantageous to the ſtate and to indivi- " duals."

Theſe

Theſe words, full of truth and judgment, made a deep impreſſion upon my mind, and tended greatly to direct my attention to the coal-mines of England when I viſited that country. Doubtleſs they did not eſcape the obſervation of the illuſtrious man before whom this converſation paſſed, and who was much more capable of eſtimating its value than I was. The following is an extract of a letter upon this ſubject, which he ſhortly after addreſſed to an eſtimable naturaliſt, who has honoured me with ſeveral marks of kindneſs: " Wood will become " extremely ſcarce in France, if the uſe of " pit-coal be not introduced in that country " as it has been in England, where it at " firſt met with ſome oppoſition. Upon " examining the records of parliament, " during the reign of Queen Elizabeth, it " will be found, that a bill was introduced " by a member of the houſe of commons, " which ſtated, that ſeveral dyers, brewers, " blackſmiths, and other artizans and ma- " nufacturers of London, uſed coal for their " fires inſtead of wood, whereby the air was " filled with unwholeſome ſmoke and va- " pours, to the great prejudice of the health

" of

" of the inhabitants, particularly of perſons " who had lately come from the country; " and it propoſed that the uſe of this kind of " fuel ſhould be prohibited, at leaſt during " the ſeſſion of parliament. From this it " appears, that coal was not then uſed in " private houſes, becauſe it was conſidered " unhealthy. But, fortunately for the in- " habitants of London, they have paid lit- " tle attention to this objection; and they " now believe that coal rather contributes " to render the air ſalubrious. Indeed, " ſince its uſe became general, they have " not been ſubject to thoſe peſtilential fevers " which formerly ſo ſeverely afflicted them. " The inhabitants of Paris are put to an " enormous expence by the conſumption of " wood for fuel, and this expence is always " increaſing, becauſe they have ſtill to con- " quer the prejudice they entertain againſt " coal*."

While on this ſubject, I may refer to another, and a ſtill longer, letter, of the founder of American liberty, in which he enters into

* *Lettre de Benjamin Franklin, tome* ii, *page* 42, *des Expériences ſur divers Objets de Phyſique, par M. Ingenhouſe; Paris, chez Bauois.*

extenſive

extenſive details on the inconveniencies experienced in countries where the people have neither the ſkill nor the inclination to ſupply themſelves with coal, or, in caſe of the want of this mineral, with turf, as they do in Holland, where there is alſo a ſcarcity of wood. "Roads and canals," ſays he, "by which combuſtible ſubſtances may be "tranſported at a low price, in ſuch coun-"tries, are of the greateſt utility, and thoſe "who aſſiſt in conſtructing them ought to "be ranked among the benefactors of man-"kind." *

This digreſſion will, perhaps, be tedious to ſome readers; but I truſt it will be excuſed on account of the motive which gave riſe to it. I could not avoid entering into ſome details upon the nature and uſe of coal, ſince it is a ſubject ſo intimately connected with the comfort of the poor, and the proſperity of my country. Unfortunately, moſt governments are deaf to their own intereſts: it would then be criminal to weary of repeating the ſame thing even a hundred times over, when the obſervation is founded upon

* *Idem*, vol. ii. page 419.

experience,

experience, and recommends a meaſure which would tend to promote the happineſs of the human kind.

I ſhould have wiſhed to have remained at leaſt a fortnight at Newcaſtle, in order that I might examine its various manufactures more minutely; but I could not dedicate more than five or ſix days to this purpoſe; for my principal object being a journey to the iſland of Staffa, it was neceſſary to proceed northward, leaſt the favourable ſeaſon ſhould paſs away. We, therefore, made preparations for travelling to Scotland, and left with regret the town of Newcaſtle, which afforded ſo rich a field of obſervation. The evening before we ſet out, we took leave of Mr. David Crawford, who had ſhewn us ſo much kindneſs, and who inſiſted that I ſhould take ſome ſpecimens of the natural hiſtory of the country, which he had ſelected for me.

CHAPTER VIII.

Departure from Newcaſtle.—Itinerary.—Baſaltic Lava.—Trapp.—Porphyry.—Fine Rock of Trapp at Dodmill, near Thirleſton.—Trapp of different Colours near Channel-kirk-Inn.

As it required ſome time to arrange my notes, and to pack up the different ſpecimens of ſtone, coal, and other foſſils, which I had collected, it was two in the afternoon before we found it convenient to leave Newcaſtle. The remaining part of the day was ſufficient to enable us to reach Wooler, which is at no great diſtance.

Travellers who love natural hiſtory commonly take a pleaſure in examining thoſe collections of broken ſtones, ſo frequently to be met with heaped up on each ſide of public roads, and which they are deſtined to repair. They preſent an eaſy means of acquiring, if not a perfect knowledge, at leaſt a pretty correct idea, of the phyſical and geological ſtate of a country. Thus bridges

and

and highways, which open ſo many uſeful communications, and prove ſo beneficial to the public, merit alſo the gratitude of the naturaliſt.

It will have been obſerved from the Itinerary which I have ſketched, that limeſtone, either in rocks, banks, or in beds, is found all the way until very near Newcaſtle; but it ought to be remarked, that in proportion as the calcareous ſubſtances diſappear, their place is occupied by vaſt depoſits of pebbles and rounded flints, which form entire hills, and deſcend to a great depth in the earth. Sometimes the pebbles alternate with beds of freeſtone, gravel, argil, and other tranſported ſubſtances, which cover the coal-mines of Newcaſtle. This indicates a ſudden and rapid revolution, which has produced great changes, and accumulated by the force of currents ſubſtances frequently of an heterogeneous kind. The line of ſeparation between the limeſtone and the granite is always diſtinguiſhed by a ſort of intermediate zone, which merits all the attention of naturaliſts.

Here are uſually found coal, hæmatites, ochreous iron ore, and ſometimes lead ore:

with regard to the ores, indeed, this arrangement may experience ſome exceptions; but in the numerous obſervations which I made, I found no variation in the order of the other ſubſtances. I always found pebbles, rounded flints, breccias, pudding-ſtones, gravel, and quartzoſe grit, frequently mixed with ſpangles of mica, in this intermediate girdle, which ſeems to ſeparate the calcareous hills from the chains of granite.

From Newcaſtle to Wooler, the heaps of ſtones collected for repairing the road are, throughout the whole of that diſtance, compoſed of black baſaltic lava broken in pieces. I do not know whence theſe lavas are brought: they may have been tranſported by ſea, or by the canals which afford the greateſt facilities for bringing them to this place. I ſaw nothing of a volcanic nature near the road.

In approaching Wooler, we enter among porphyries; and blocks, of a conſiderable ſize, may be every where ſeen, ſcattered here and there in the fields, by ſome great revolution. The feld-ſpar of theſe porphyries is leſs durable than the reſt of the ſtone, is partly deſtroyed in ſome blocks, and

appears

appears corroded and carious in others; thus the porosities of these porphyries is such, that, to a certain depth, they have the appearance of burnt stones, but they are entire, and have not been touched by fire. They resemble very much the porphyries of the mountain of Esterelle, in Provence, on the road from Frejus to Antibes, which are covered with pores, solely in consequence of the decomposition of the feld-spar.

From Wooler we proceeded to Cornhill, crossed the Tweed, and entered Scotland, passed through Coldstream, Greenlaw, and Thirlestone.

The country, near Cornhill, is every where covered with rounded trapps, which very much resemble basaltes; and it is necessary to pay particular attention to this subject, since these trapps, which are absolutely foreign to volcanos, are, notwithstanding, accidentally mingled with real lavas of a black compact kind, which the same revolution has collected together. The same order of substances continues almost to Tibby's inn.

But it is at a short distance from Thirlestone, near Doddmill, and by the side of a

bridge, under which the ſtream that turns the mill flows, that the curious obſerver muſt place himſelf, in order to view with advantage a depoſit of trapp ſo conſiderable, that it would be difficult to find any where elſe ſo many vaſt maſſes, and ſo many varieties thus fully laid open.

This local circumſtance is owing to the little river which precipitates itſelf in caſcades againſt the banks of this ſtone. It is obvious, from the width of its bed, and the ravages which it has committed, that the rivulet, though inconſiderable in ſummer, muſt be a furious torrent when ſwelled by rains or melting ſnows. It has completely uncovered the craggy exterior of this maſs of trapp, the different beds of which, more or leſs thick, are diſpoſed in the form of ſteps, and ſeem juſtly to warrant the application of the name which the Swedes have given to this ſtone *. I certainly did not expect to find, near the road, ſo fine an object for ſtudy. The moment we obſerved it, we proceeded to the bed of the torrent, where we employed a conſiderable time in

* *Trappa*, in the Swediſh language, ſignifies *ſtairs*.

examining

examining the different ſubſtances, obſerving their poſition, their form, and the various adventitious matters which attracted our attention, and in collecting ſuch mineralogical ſpecimens as chiefly intereſted us.

Throughout a conſiderable extent we diſtinguiſhed parallel beds of black trapp, ſeveral of which were two feet thick, others one foot, and ſome four or five inches, and even leſs. The hardeſt ſtrata repoſe upon a finer, a leſs compact, and a leſs adheſive kind of trapp. The action of the current deſtroys the laſt ſort throughout its whole length, occaſions breaches and hollows, on which the feet may be placed, and by which this maſs of trapp may be eaſily aſcended.

To the trapp, which is the hardeſt, heavieſt, and of the roughest grain, there ſucceeds a ſtone, which reſembles it at firſt ſight, but which is of a finer compoſition, when expoſed to the air ſeparates into very thin lamellæ, and is found to be maculated with mica. It is known that there is a kind of trapp which decompoſes in the air, and which, in that ſtate, might be taken for argil. Near the ſame place, the ſyſtem of beds is, to a certain diſtance, interrupted by

priſms: the matter muſt have adopted this form during the period of the drying of the maſſes, accumulated and depoſited by the aqueous fluid, for it is certain that there is nothing here of a volcanic nature.

The trapp ſeems alſo ſometimes to ſhoot into veins, in which there appear holes of the ſize of man's head; but it appears that theſe cavities, the edges and internal parts of which are ſmooth and poliſhed, owe their formation to the force of the torrent, which attacks and deſtroys the more tender parts of the trapp.

Finally, it is proper to obſerve, that the maſs of trapp which I have deſcribed is, at it were, planted in a hill of porphyry, to which it adheres. The laſt ſtone is found in a very advanced ſtate of decompoſition, for it is almoſt entirely converted into earthy matter.

The hill of Doddmill is contiguous to a ridge of other hills nearly ſimilar, which ſkirt the highway, and which ſtretch beyond Channel-kirk-inn. It exhibits ſeveral veins of trapp, which croſs ſometimes an entire rock of porphyry, ſometimes a ſubſtance of an argillaceous appearance, and which is occaſionally grey, greeniſh, brown, or of the colour

colour of rusty iron, crumbles, exfoliates, and seems to be of the same texture with the basis of porphyry. The crystals of feld-spar, which constitute porphyries, are, indeed, in general wanting; but I have collected specimens, in which some of them are to be found *.

The following are the principal varieties of trapp which I met with at Doddmill, or in the contiguous hills on the road to Channel-kirk-inn.

1. Hard black trapp †, of a fine dry grain, and having a resemblance to volcanic basaltes, but which is not, like it, magnetic, is less hard, and yields a powder of a greyer colour.

2. The same trapp ‡, intersected by some veins of white quartz.

* There is a similar substance at Renaison, in the mountains of Forest, where there may be seen very fine specimens, in which the porphyric basis is entirely destitute of the crystals of feld-spar on one side, while on the other they appear in parallelopipeds, and form perfect porphyry.

† *Corneus trapezius colore nigrescente, vel obscuro.*— Waller, vol. i. page 363. *Trapezum nigrum particulis impalpabilibus, lapis lydius.* Deborn, page 161.

‡ Faujas, *Essai sur les Roches de Trapp.* Variété 16, page 107.

3. Trapp

3. Trapp of a blueiſh-black colour*, maculated with dots of red and green feldſpar, which aſſume no regular cryſtaline form. Theſe ſpecimens may be conſidered as exhibiting a paſſage from trapp to porphyry, but which is here only in its commencement.

4. Black trapp, of a very fine grain†, delicate and fiſſile; and in which ſome ſpots of mica may be obſerved. This variety adheres to the hardeſt trapp: it is ſometimes found interpoſed between beds of ſolid trapp, ſometimes in depoſits of a ſubſtance of the nature of that which forms the baſis of porphyry.

5. Brown trapp, of a leſs fine grain‡, in which may be diſtinguiſhed ferruginous ſpots changed into brown ochre: the colour of this trapp is evidently owing to the decompoſition of iron.

Theſe five varieties abound at Doddmill;

* *Trapezum ſpato ſcintillante rubeſcente mixtum.* Deborn, page 151.

† *Saxum corneo et mica mixtum, ſaxum corneo micaceum fiſſile colore nigreſcente.* Waller, vol. i. page 420.

‡ Faujas, *Eſſai ſur les Roches de Trapp.* Variété 6, page 92.

they

they are not affected by acids, and have no influence upon the magnetic needle.

6. Purple coloured trapp*, adhering to black trapp. I only mention this variety to shew, that the iron, in decomposing, may experience various modifications in its colour; for this violet trapp is incontestibly the same as the black trapp, with which it forms one body, and on the face of which may be traced the gradations of change in the colouring principle.

7. Trapp†, the ferruginous particles of which are changed into an ochrey red: this modification of the iron has impaired the cohesion of the parts, so that this trapp is not so hard as that in which the decomposition is less advanced.

8. Trapp, of a yellowish-grey colour‡. If this kind be not examined with attention, it may be mistaken for freestone, though it is really of a very different nature: its appearance will easily deceive. Like the other kinds it adheres to black trapp, of

* Faujas, *Essai sur les Roches de Trapp.* Variété 6, page 92.

† *Corneus trapezius rubens.* Waller, vol. i. page 362.

‡ *Corneus trapezius solidus griseus.* Ibid.

which

which it is only a modification, the conſtituent elements of both being the ſame.

9. Dull violet coloured trapp *, approaching the ſtate of real porphyry, in conſequence of the addition of cryſtals of white feld-ſpar.

This porphyric trapp joins to the black trapp, and lies like it in projecting ſtrata, reſembling ſtairs. In ſome places, theſe ſtrata ſucceed each other without any interruption; in others, they are croſſed by beds of pure and entire black trapp. This porphyry alſo varies conſiderably in its colour, according to the greater or leſs degree of its hardneſs, or the quantity of feld-ſpar it contains, which appears ſometimes in dots, ſometimes in unformed grains, and at other times in regular cryſtals. On the one hand, ſome portions of ſubſtances are deſtitute of feld-ſpar, while on the other the contiguous parts contain it.

In ſhort, this vaſt depoſit, this immenſe accumulation of materials proper for the compoſition of porphyry, and which form a ridge of hills, from Doddmill to Channel-

* Faujas, *Eſſai ſur les Roches de Trapp.* Table ſynoptique, variété 29, page 148.

kirk-

kirk-inn, ſeems to exhibit the effect of a ſudden operation of nature, of a confuſed and tumultuous precipitation, which has prevented the homogeneous ſubſtances from mutually attracting each other, and obeying thoſe laws of affinity by which regular compoſitions are formed.

Nature, conſidered under this point of view, is certainly not without intereſt, for him who delights in ſtudying her magnificent operations. I ſhould wiſh to ſee this ſuperior kind of chymiſtry aſſociated with that of our elaboratories.

I have, perhaps, dwelt too long upon a ſubject which cannot be generally intereſting; but the hills of Doddmill and Channel-kirk-inn being ſituated on the road to Edinburgh, I have thought it of conſequence to point them out to thoſe who conſider the materials that enter into the formation of mountains, objects worthy of their attention and inquiries. It would be difficult to find a place more favourable for this ſtudy, ſince here it may be ſaid, Nature diſplays herſelf uncovered, and affords the obſerver an opportunity of tracing the manner in which ſhe rudely ſketches or perfects porphyry, with a baſis of trapp.

The

The ſtay we made at the foot of theſe hills being very agreeable, the time paſſed away inſenſibly, and we did not arrive in Edinburgh until half paſt nine in the evening. Our poſtillions conducted us to Dunn's hotel, a magnificent inn, decorated with columns; but the inſide of which, though very neat, did not correſpond with the exterior grandeur of the edifice.

Next day we waited on Doctor Black and other learned men, for whom we had letters: we took only a rapid view of the town, and, notwithſtanding the kind reception which all the gentlemen to whom we were recommended were eager to give us, we delayed the pleaſure of paying our reſpects to them more particularly, until we ſhould return from the Hebrides. The ſeaſon was already ſo far advanced, as to give us reaſon to fear the dangers of the ſea, which environs theſe iſlands. We intended beſides to paſs a few days at Glaſgow, on our way to the highlands, becauſe we could not have the opportunity of ſeeing that city on our return, having determined to come back by Perth: we therefore agreed to make, at preſent, but a ſhort ſtay in Edinburgh.

CHAP-

CHAPTER VIII.

Doctor Swediaur—Preſtonpans, its Manufactories and excellent Oyſters.—Grand Iron Foundery of Carron.—Stirling.—Departure from Edinburgh.

I HAD the unexpected pleaſure of meeting, in one of the ſtreets of Edinburgh, a learned German, whom I had ſeen ſome years before in Paris, at the houſes of Abbé Fontana of Florence, and Doctor Ingenhouſz, with whom he was connected by ſcientific purſuits. It was Doctor Swediaur, a phyſician, who had long reſided at London, was particularly converſant in the knowledge and treatment of the venereal diſeaſe, and had publiſhed upon that ſubject a work full of new views derived from profound ſtudy and a ſkilful practice *.

* Doctor Swediaur is now in Paris, employed in preparing a ſecond edition of his work, which is to be enlarged by another volume. This book will be found to contain ſome new and intereſting hiſtorical reſearches, and a number of obſervations calculated to promote the knowledge of this diſeaſe and its treatment. He is to publiſh it in French.

He

He told me, that wiſhing to enjoy a little repoſe, and to amuſe himſelf with the chymical arts, in which he was deeply ſkilled, he had quitted the capital of England, and had purchaſed an eſtate about five miles from Edinburgh, in the village of Preſtonpans, and by the ſea-coaſt; where he intended to eſtabliſh a manufacture of ſea-ſalt, principally with a view to ſeparate the mineral alkali from the muriatic acid.

He begged that I would go to ſee the works which he had begun to conſtruct, and as I had but a ſhort time to remain at Edinburgh, it was agreed that I ſhould go to dine at his houſe the next day.

Preſtonpans is very advantageouſly ſituated for the eſtabliſhing of manufactures; the proximity of the ſea, and the abundance of pit-coal found in the neighbouring mines render it extremely convenient for this purpoſe. The coal of the place, which is the ſame as that uſed at Edinburgh, has the merited reputation of being of an excellent quality. It burns with a vivid, bright, and long-continued flame; its cinder is grey and light. The only fault found with it is, that it is conſumed a little quicker than the Newcaſtle

caſtle coal; but I ſhould prefer the Edinburgh coal to that of Newcaſtle; I do not know any that makes a more agreeable fire.

Swediaur ſhewed me at Preſtonpans the ſeat of the greateſt manufactory of the oil of vitriol in Britain. I ſay the ſeat only, becauſe the whole of the place is ſurrounded with a very high wall, which does not permit the eye to diſcover even the chimney tops of the works. A ſmall harbour has been contrived to admit the veſſels which bring the ſulphur; but every thing is ſo carefully enveloped in myſtery, that the harbour itſelf is ſurrounded with walls of a great height. All is concealed in this manufactory, and none can enter but the perſons in employment. The only thing known is, that the oil of vitriol (ſulphuric acid) which it produces, forms an article of very extenſive commerce. I do not ſuppoſe, however, that the proceſſes employed here can differ much from thoſe which are generally known, and which conſiſt in burning the ſulphur in chambers lined with lead. The ſuffocating ſmell perceived at a diſtance ſeems to announce that they are the ſame. But they may have ſome proceſſes here for rectification,

fication, or other purpoſes, which they are deſirous of concealing.

A great deal of ſea-ſalt is alſo made at Preſtonpans, for home conſumption, and as an article of commerce. It is produced by means of fire and evaporation. We found no difficulty of admiſſion to the ſalt-works, which are very numerous.

The ſea-water is raiſed by pumps into immenſe boilers, of an oblong ſquare form, which are not at moſt above eighteen inches deep, and are conſtructed of ſtrong plates of iron cloſely joined to each other. The boiler is ſupported on ſtrong bars of caſt-iron. The furnaces are placed immediately underneath, and divide into ſeveral vents which reach to the extremities of the boiler. There are four or five of theſe furnaces to each boiler, according to its ſurface, and they are ſupplied with fuel of pit-coal. The water is by this means kept in continual ebullition; and freſh ſupplies are pumped in, in proportion to what evaporates, until the ſalt is formed in a quantity ſufficiently large to be taken out. By this ſimple proceſs, there is procured a white ſalt of very good quality, excellent for cookery and other uſes, but not very

very proper for curing proviſions, nor ſo good as French ſalt for that purpoſe.

I obſerved in theſe ſalt-works, where artificial ebullition ſupplies the place of natural evaporation, that the atmoſphere is always a little loaded with marine acid in the form of vapour, which quickly corrodes and deſtroys the poliſh of ſteel. I experienced its effects on the buttons of my clothes, which were covered with ruſt in about ten minutes. This vapour alſo affects the ſmell, and is ſomewhat injurious to the lungs.

This is certainly not the marine acid diſengaging itſelf from the mineral alkali; their union is too intimate for that ſuppoſition. The moſt violent fire acting upon ſea-ſalt volatilizes rather than decompoſes it; an intermediate ſubſtance is always neceſſary for the latter purpoſe. But there is ſometimes found in ſalt a ſmall portion of the muriatic acid, united with magneſian earth; and as this baſis fixes it but feebly, it is capable of being diſengaged by ebullition.

Doctor Swediaur conducted me to the piece of ground which he had purchaſed; where the works for making ſalt were conſiderably advanced; the boilers being already

erected. I ſaw all theſe operations with much intereſt.

I eat ſome excellent oyſters at the table of this learned phyſician. This was not to be wondered at, as I was in the place where the beſt oyſters are taken in abundance; they are found in great quantities on banks at a little diſtance from the ſhore. They are large, plump, and of an exquiſite taſte; and are held in ſuch eſtimation, that they are exported to the principal cities of England and Holland. Large quantities alſo are pickled, put into barrels, and ſent wherever there is a demand for them.

The poſition of Preſtonpans, and its proximity to the city of Edinburgh, render it very agreeable; and one who loves ſtudy and tranquillity may here ſpend ſome very happy hours. It is therefore, not ſurpriſing that Swediaur, fatigued with the buſtle of London, ſhould have given this ſpot a preference, and have ſettled in it, for the more uninterrupted proſecution of his ſtudies and uſeful occupations.

I paſſed a very inſtructive day at his houſe, and returned with him in the evening to Edinburgh. He had the goodneſs to accompany

company me back, with the intention of conducting me the next day to Carron, to visit the greatest iron-foundery in Europe, but where it was impossible to obtain admission without very strong recommendations. Swediaur was acquainted there; and I esteemed myself very fortunate in being able to make so useful an excursion under his auspices.

From Edinburgh to Carron are reckoned thirty-six miles; but the road is excellent. Count Andreani, Thornton and myself set out in company with Swediaur at six in the morning. We did not alight till we reached *Linlithgow*; where we took some refreshment. We then proceeded to *Falkirk*, and about half past three in the afternoon we arrived at Carron. The soil from Edinburgh to the very entrance of Carron was strewed with large round blocks of basaltes. This volcanic lava, broke into small pieces, is used for hardening the road; and there can be no better nor more durable roads than such as are made of this substance.

Immediately on our arrival, Swediaur wrote a note to a person belonging to the manufactory, with whom he was acquainted. An answer was returned, that it was ne-

ceſſary to leave the name, deſignation, and reſidence of each of us. The demand was inſtantly complied with; and a few minutes after we were told that we were at liberty to enter.

A man attended us at the gate, who ſaid that he was ordered to conduct us every where, with the exception of the place where the cannons are bored, which no ſtranger was permitted to ſee. X

He conducted us at firſt into an immenſe court, ſurrounded with high walls and vaſt ſheds. This place was covered with cannons, mortars, bombs, balls, and thoſe large pieces which bear the name of carronades. Amidſt theſe machines of war, theſe terrible inſtruments of death, gigantic cranes, capſtans of every kind, levers, and aſſemblages of pullies, ſerving to move ſo many articles of enormous weight, are erected in ſituations convenient for that purpoſe. Their various movements, the ſhrill creaking of pullies, the continued noiſe of hammers, the activity of thoſe arms which give impulſion to ſo many machines;—every thing here preſents a ſpectacle as new as intereſting.

Under the ſheds where the finiſhed arti-

cles

cles are depoſited, we ſaw ſeveral rows of rampart cannon, battering guns, and field-pieces, deſtined for Ruſſia and the Emperor. They were longer than ordinary, of the moſt perfect workmanſhip, and covered with a thin varniſh, of a ſteel colour, to preſerve them from ruſt. Their carriages were of caſt iron, and poſſeſſed the greateſt ſimplicity of conſtruction; they appeared to me to unite the merit of the ſtrongeſt ſolidity, to that of being free from the numerous appendages belonging to wooden carriages, which ſerve only to render the working them more difficult, to obſtruct their motion, and to occaſion the neceſſity of frequent repairs.

The ſubſtance which the cannons are varniſhed with is kept a great ſecret; but I am inclined to think, that it is compoſed of a fat deſiccative oil, to which there is added a certain portion of varniſh of amber, mixed with plumbago*.

The large buildings where the cannons are bored are not at a great diſtance from

* For my own ſatisfaction, I have made ſeveral experiments with theſe ingredients, and they ſeemed to anſwer the ſame purpoſe.

the firſt yard. We paſſed cloſe by them; but were very politely told, that particular proceſſes and machines unknown to every other eſtabliſhment of the kind, rendered it neceſſary to keep that place concealed from ſtrangers. We thought this was very reaſonable, and followed our conductor to another quarter*.

He conducted us to the works for ſmelting the ore; where four furnaces, of forty-five feet in height, devoured both night and day enormous maſſes of coals and metal. One may from this judge of the quantity of air neceſſary to feed theſe burning gulphs, which diſgorged, every ſix hours, whole floods of liquid iron. Each furnace is ſupplied by four air pumps, of a great width; where the air, compreſſed into iron cylinders, uniting into one tunnel, and directed towards the flame, produces a ſharp ruſtling noiſe, and ſo violent a tremor, that one not previouſly informed of it, would find it difficult

* I have ſeen the inſtruments with which cannon are bored at the foundery of Creuzot, near Montcenis, in Burgundy. The preciſion of theſe vaſt and ſuperb machines, which are moved with water, raiſed by ſteam engines, is moſt wonderful: I doubt whether it is ſurpaſſed by the engines of Carron.

to

to avoid a ſenſation of terror. Theſe wind machines, this ſpecies of gigantic bellows, are put in motion by the action of water. Such a torrent of air is indiſpenſably neceſſary to ſupport, in the higheſt ſtate of ignition, a column of coal and ore forty-five feet high; and it is ſo rapid and active, that it projects a vivid and briſk flame more than ten feet above the top of the furnace.

An open area, of very great extent, built in the form of a terrace, and on a level with the upper aperture of the fire-places, is appropriated to the reception of the ſupplies of ore and coals; and on this platform are alſo ſpacious areas, where the coal is prepared for uſe. As the coal uſed here conſiſts almoſt wholly of large lumps, the proceſs by which they convert it into *coke* is completely different from that employed at Newcaſtle, where the coal duſt only is applied to that purpoſe. At Carron foundery, this buſineſs is done in the open air, and in the moſt ſimple manner. A quantity of coal is placed on the ground, in a round heap, of from twelve to fifteen feet in diameter, and about two feet in height. As many as poſſible of the large pieces are ſet on end, to form

paſſages

paſſages for the air; above them are thrown the ſmaller pieces, and coal-duſt, and in the midſt of this circular heap is left a vacancy of a foot wide, where a few faggots are placed to kindle it. Four or five apertures of this kind are formed round the ring, particularly on the ſide expoſed to the wind. There is ſeldom, indeed, occaſion to light it with wood; for theſe purifying works being inceſſantly in action, they generally uſe a few ſhovels of coal already burning, which acts more rapidly than wood, and ſoon kindles the ſurrounding pile.

As the fire ſpreads, the maſs increaſes in bulk, puffs up, becomes ſpongy and light, cakes into one body, and at length loſes its bitumen, and emits no more ſmoke. It then acquires a red, uniform colour, inclining a little to white; in which ſtate it begins to break into gaps and chinks, and to aſſume the appearance of the under part of a muſhroom.

At this moment, the heap muſt be quickly covered with aſhes, of which there is always a ſufficient proviſion around the numerous fires where the *coke* is prepared.

This method of ſpreading a large quantity of aſhes on the fire to deprive it of air, is ſimilar

ſimilar to that uſed in making charcoal, which is covered over with earth. The reſult is alſo pretty much the ſame; the pit-coal, thus prepared, being light and ſonorous, and producing the ſame effect in high furnaces as charcoal. This is a quality of extreme importance; ſince, by means of charred pit-coal, founderies may eaſily be eſtabliſhed in places where the want of wood would otherwiſe render it neceſſary to abandon the richeſt mines of iron.

There is ſuch a numerous ſeries of theſe places for making coke, to ſupply ſo vaſt a conſumption, that the air is heated to conſiderable extent, and that during the night the ſky is entirely illuminated with the flames. When one obſerves, at a little diſtance, ſo many maſſes of burning coal on one ſide, and ſo many volumes of flame, darting to a great height above the high furnaces, on the other—and at the ſame time hears the noiſe of weighty hammers ſtriking upon reſounding anvils, mingled with the loud roaring of bellows—one doubts whether he is at the foot of a volcano in actual eruption, or whether he has been tranſported by ſome magical effect to the brink

of

of the cavern, where Vulcan and his Cyclops are occupied in preparing thunderbolts.

I wiſhed that Volair, the painter of Veſuvius, who ſo well expreſſed the terrific aſpect of that volcano during its moſt violent nocturnal eruptions, had been here to exerciſe his pencil on this artificial volcano, which is no leſs ſtriking in its appearance than the other.

The ſupplies of ore are on the ſame terrace with the coals. A canal *, dug at a great expence, and which communicates with the ſea, ſerves to convey all the materials uſed here, and to tranſport its manufactured productions.

Three kinds of ore are employed here, which are ſtored up in diſtinct and ſeparate heaps.

The firſt conſiſts of a decompoſed hæmatites, which is procured from the county of Cumberland. It is of a reddiſh appearance, ſoft to the touch, and ſtains the hand nearly of a blood colour: it is very rich in iron.

The ſecond is a hard rocky ſubſtance, of a yellowiſh brown colour.

* The Forth and Clyde navigation.

The

The third is of a deep iron-grey colour, ſometimes inclining a little to violet, and is remarkable for being formed in *geodes* (ſeptaria), of a round or oval form, a little flattened. The largeſt of theſe geodes are about eighteen inches in diameter, and the leaſt from four to five inches.

On placing them on one edge, and giving the other a hard ſmart blow, with a hammer, which breaks them into two pieces, one is agreeably ſurpriſed to ſee their interior filled with a multitude of very diſtinct, ſmall priſms of three, four, and five ſides, and ſeparated from each other by filaments, or ſtreaks, of calcareous white ſpar, and ſometimes of ponderous ſpar, and white or yellowiſh ſpathoſe iron.

Theſe priſms conſiſt of the ſame matter with the geodes, that is of a kind of a hard unctuous iron ore, which at firſt has rather the appearance of a deep grey argillaceous ſtone, than of an ore of iron. The priſms, which muſt be conſidered as the reſult of contraction, when the ſubſtance of the geodes was ſoft, are from three to four lines broad, and from two to three inches long. Their forms are very perfect and regular; and

and in ſome of the largeſt the priſms are ſo multiplied, and diſpoſed with ſuch order, that they reſemble, in miniature, thoſe fine baſaltic colonnades, commonly known by the name of Giant's Cauſeway.

This ſpecies of iron ore is obtained in great abundance from a hill near Dunbar, a ſmall town in Hadingtonſhire, about thirty-ſix miles from Edinburgh, cloſe by the ſea, and, conſequently, very convenient for the conveyance of the ore. It affords a great quantity of iron, which one would not expect from its appearance to the eye; but analyſis and experience have proved that it is valuable. It is neceſſary to calcine it before it is put into the ſmelting furnace.

By the due intermixture of theſe three ores, there is obtained a grey, crude iron, of a good quality, which is applied to the moſt extenſive uſes. It is ſo ſoft as to yield eaſily to the fire; and, as it is alſo very pure, may be moulded into the moſt delicate forms.

It may juſtly be ſuppoſed, that it was not without repeated unproductive experiments, proceſſes, and expences, that this eſtabliſhment arrived, at length, at its preſent high ſtate of perfection, in which every thing is appointed,

appointed, every thing is executed, with ſuch uniform preciſion, that nothing is entruſted to ordinary routine or chance.

The minerals are intermixed with method, carefully weighed, and put into baſkets of equal dimenſions. The ſame attention is obſerved with reſpect to the coals. Every thing is placed in regular order, within reach of the founders, under ſheds appropriated to that ſervice. The baſkets for each charge are always counted out; a clock, erected near the large furnaces, determines the preciſe time of putting in the charge. The ſame form is obſerved with reſpect to the diſcharging of the furnaces; the ſtroke of the bell announces the moment when they ſhould proceed to that operation; and every one of the workmen flies to his poſt.

We viſited the place where the crude iron is refined in reverberatory furnaces, to be afterwards caſt into cannons, mortars, howitzers, bombs, balls, &c. We ſaw, alſo, that where the moulds are prepared, and another place where they are dried.

We were then conducted into a vaſt fabric, which ſuggeſted the moſt pleaſing ideas,

ideas, for its productions conſiſted of the various implements of agriculture, the arts, and domeſtic uſe; in this place were made coppers of five feet diameter, for the making of ſugar in the Weſt-Indies; ſtoves, in the ſhape of an antique urn, mounted upon pedeſtals; hearths of all kinds, and of the fineſt faſhions for pit-coal fires; kitchen ranges, with all their appendages, boilers, tea-kettles, ſauce-pans, neatly and ſolidly tinned; ſpades; hoes, of different ſorts, for cultivating the ſugar-cane, which were ground to a ſharp edge on large whet-ſtones; baſſo-relievos, of the moſt excellent model, for chimney backs: in one word, every thing, even to caſt iron hinges and bolts for doors; and the greater part of theſe productions are ſold at ſo moderate a rate, that a man of very ſlender fortune may here procure many articles of neceſſity, and even of ornament, which cannot be obtained elſewhere at three times their price. But labour and workmanſhip are, in this place, aſſiſted by ſo many machines and ingenious proceſſes, that its commodities are executed, both in a ſhorter time and with greater perfection, than in other eſtabliſhments of the ſame kind.

I ſhould

I ſhould not forget to notice a very ſimple machine, which ſerves to grind and reduce to a very fine powder the charcoal uſed for ſprinkling over the moulds; it conſiſts of a kind of mortar of caſt-iron, ſeveral feet in diameter, cloſely ſhut with a wooden cover, perforated in the middle, to admit the paſſage of a vertical cylinder, which forms the principal mechanic power of the machine, being turned round on its own axis by a wheel, which is moved by water.

Two iron bars paſs horizontally through the bottom of the vertical axis, in the manner of a croſs, and they may be raiſed or lowered at pleaſure, by means of ſeveral holes, at different diſtances, in the axis.

This croſs divides the area or capacity of the mortar into four portions, two of which are occupied by two iron balls, nearly as large as ordinary bombs, but entirely ſolid, and of a poliſhed ſurface. The moment the axis is put in motion, the balls begin to roll round after each other, and thus ſpeedily bruiſe the charcoal. But as by this means the latter might be compreſſed only, without being reduced to a fine powder, the two other ſpokes are furniſhed with teeth in the man-

ner of a rake, which ſtir up the charcoal from the bottom of the mortar, and turn it on every ſide; ſo that in a very ſhort ſpace of time, and with little trouble, whole ſacks of charcoal may be ground to an impalpable powder, without any loſs of ſubſtance.

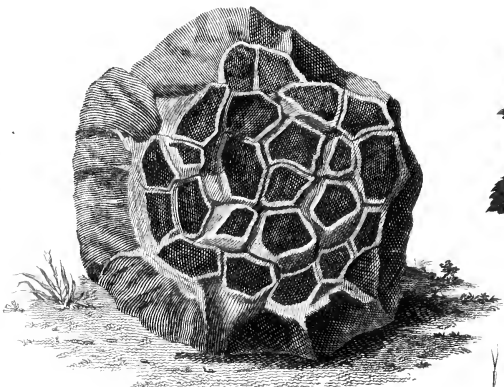
Conceiving that a correct repreſentation of a geode of Dunbar, as it appears on being broken, might be intereſting to naturaliſts, I cauſed one to be drawn in its natural ſize, which will be ſufficient to give an idea of the others (ſee plate I.*). The largeſt differs from this only in having a greater number of priſms. Sibald, in a work entitled *Scotia Illuſtrata*, printed about two hundred years ago, gives a repreſentation of this ore, which was known even at that period; but the engraving ſeems to have been taken from a ſimple ſketch only, which badly expreſſes the object.

It is time that I ſhould leave the foundery of Carron, and proceed to other objects. I ſhould wiſh to have ſaid more reſpecting it

* In an eſſay on the theory of the earth, printed at Edinburgh, in 1785, Doctor Hutton has alſo given an engraving of a ſpecimen of the priſmatic ore of Dunbar.

in

IRON STONE of Dunbar forming a Geode with prismatic Septa the interstices of which are filled with ponderous Spar & white calcarious Spar



LIGUSTICUM SCOTICUM.

in fewer words; but, whilſt I directed all my attention to ſo intereſting and complicated a manufactory, I was obliged to truſt ſolely to my memory for retaining the facts; for it was not to be preſumed that I was at liberty to take notes of them in writing. I was therefore obliged to occupy a part of the night in digeſting my obſervations. I am conſcious that there are many things which I have not ſufficiently inveſtigated, and others reſpecting which I have gone into too minute a detail. But when one views an object ſo rapidly, that is, when one has not time to view it well, it will be impoſſible for one to deſcribe it well. Others may have had better opportunities, and I requeſt that they will correct ſuch omiſſions and errors as have eſcaped me.

As we were at no great diſtance from Stirling, we went on the next day to ſee that ſmall city, formerly the reſidence of the kings of Scotland. There is ſtill ſtanding a wing of the ancient palace, which exhibits the remains of former grandeur, and is now occupied by the governor of the caſtle. We likewiſe viſited the parliament-houſe, which

conſiſts of an apartment one hundred and twenty feet long, but now in a decayed condition. The doors are of oak, and covered with baſſo-relievos, and very ancient inſcriptions. I had not ſufficient time to make a drawing of them, nor of ſome other baſſo-relievos in ſtone, which I ſaw fixed in old walls near the market-place.

Theſe pieces of ſculpture, which had the appearance of ſepulchral monuments, are done in a ſingular ſtyle, ſomewhat reſembling that of the Egyptians; they conſiſt of figures wrapped up in a covering like the ſwathing of mummies.

This city is very ancient: the Phenicians traded to Cornwall for tin; and it is therefore not improbable that that travelling and commercial people might have had ſome *entrepôt* in this part of Scotland. Its monuments, if we may judge by thoſe of Malta, diſcover an evident reſemblance to the monuments of the Egyptians, as far at leaſt as reſpects the tombs of the latter. I merely mention this by the way, to induce the antiquarian ſociety of Edinburgh to verify or refute my conjectures.

I wiſhed

I wiſhed much to have had an opportunity of paying my reſpects to Lord Kaimes, who carried agricultural improvement to ſo high a pitch of perfection, on an eſtate which he poſſeſſed at a ſmall diſtance from Stirling; but I was told that he was then at London; by which I was deprived of the pleaſure of ſeeing a man who was ſo highly reſpected and eſteemed for his private virtues, and his love of rural life.

We went round the extremity of the arm of the ſea, called the Frith of Forth, which terminates at Stirling, near the mouth of the river Forth, from which it derives its name; and proceeded through Aloa, Clackmanan and Culroſs, where there are coal-pits of very excellent quality.

The ground is covered with compact lavas, and other lavas formed by volcanic eruptions of mud. The beds of coal, which are more than a hundred feet beneath the ſurface, have remained untouched by the heat of the lavas above them. But it is very remarkable, that theſe rich mines of coal extend to a great diſtance under the bed of the ſea, and that the workmen, guarded againſt a few leaks by ſteam-engines,

which raiſe the water out of the pits, continue their labour in perfect ſecurity, and without the leaſt anxiety from the enormous maſs of water rolling over their heads.

Thus, while the bold and indefatigable miners, feebly lighted by the diſmal glimmering of their lamps, make theſe profound cavities reſound with the ſtrokes of their mattocks, veſſels, borne along with a propitious breeze, paſs in full ſail over their heads; and the ſailors, enjoying the fineneſs of the weather, expreſs their happineſs in ſongs. At other times the tempeſt lowers, the horizon flaſhes with fire, the thunder roars, the ſea rages, all is wrapped in terror, and the crew tremble. But the tranquil miners, ignorant of what is paſſing aloft, joyful and happy, ſing in chorus their pleaſures and their loves, whilſt the veſſel is daſhed in pieces, and ſwallowed up in the devouring gulph above them.—Unfortunately, too true a picture of the daily viciſſitudes of human life!

From Culroſs we proceeded to Inverkeithing, where we croſſed the Frith of Forth to Queensferry, and regained the road to Edinburgh.

I intended, on our return from the Hebrides, to make a ſufficient ſtay at Edinburgh to permit us to become more particularly acquainted with that city and its environs, I ſhall poſtpone my obſervations reſpecting them till that period. We made every preparation to be able to leave Edinburgh by the next morning; and that we might have nothing to do but to ſtep into our chaiſes, we ſettled our reckoning at night. The charges demanded of us were more than double the rate of thoſe which we had paid at the beſt and deareſt inns on the road; though, as generally happens, we were nowiſe better entertained. The bill preſented to us was more than an ell long, and decorated with flowered borders; and, to prove that nothing was omitted in it, they had not failed to ſet down half a ſheet of paper, which one of us had called for, to ſave the trouble of opening his portfolio.

	l.	*s.*	*d.*
To paper . . .	0	0	3
To a porter for bringing the ſame . .	0	0	3

that is in all about twelve French ſous. We

paid the bill without ſaying a word, but we took care not to return again to Dun's hotel to lodge, under columns leſs heavy than the rapacious hand of the landlord.

CHAP-

CHAPTER IX.

Departure from Edinburgh.—Livingſton.—Moorhead craigs—Prisms of Baſaltes.—Hearſthill.—Ball of Baſaltes.—Cubical Lavas.—Peats.—Pit Coal.—Glaſgow.—Natural Hiſtory.

FROM Edinburgh to Livingſton is fifteen miles; the road, as well as the adjacent fields, is ſtrewed with fragments and blocks of baſaltes. Six miles from Livingſton, and in a place called Moorhead-craigs, we obſerved by the roadſide a ſmall peak of baſaltes, having a tendency to divide into priſms, of which there already appeared a few groups, very diſtinctly formed.

Hearſthill is three miles diſtant from Moorhead-craigs. The traveller ought not to neglect viſiting here a grand natural ball of baſaltes, which lies on the weſt ſide of the road. Its ſhape is ſomewhat oval, and its greateſt diameter is about five feet. The cruſt or exterior envelope, which is very hard,

hard, and quite ſound, is three inches thick, and contains another ſolid ball equally ſound, and of the ſame form. It is remarkable that the ſpace between the ſolid ball and the hollow cover is well defined, and more than an inch wide. The covering appears completely detached from it on all ſides; though they muſt neceſſarily touch at ſome points not expoſed to view.

The ſame revolution which removed and tranſported to this place a ball of ſuch bulk and weight, has ſo conveniently broken off a piece of the cruſt, that one might imagine it had been purpoſely detached to diſcover its interior ſtructure.

That lucky accident, that contraction of the lava on all ſides at the time of cooling, which produced this kind of volcanic geode, is worthy the attention of naturaliſts. It is with pleaſure, therefore, that I point out the place where I obſerved that baſaltic ball, which may be very eaſily found. It lies on a riſing heath near Hearſthill, and ſix paces to the left of the road from Edinburgh to Glaſgow.

This place preſents another object, no leſs worthy of attention, and which well

deſerves

deſerves to be profoundly examined by the naturaliſts of Edinburgh or Glaſgow, who have it more in their power to inform us of thoſe facts and details, which, to be fully developed, would require a pretty long continuance on the ſpot.

The lands of Hearſthill conſiſt of a flat tract on an eminence; and this elevated plain is covered with blocks and fragments of compact lavas, which appear to have been carried thither by ſome convulſion of nature.

At a little diſtance from the baſaltic ball, which I have mentioned, and in an oppoſite quarter, that is, to the left of the road, there are ſeveral ſmall eminences, covered with a thick and moſſy herb, which ſeems to riſe out of a black and marſhy earth; yet in this place there is neither marſh nor water.

Some of theſe elevated ſpots have been partly dug away; and one may there ſee with aſtoniſhment, 1ſt, a ſtratum, from two and a half to three feet thick, of good turf, which ſerves for the uſe of the circumjacent country; 2dly, large beds of clay, intermixed with maſſes of baſaltes; 3dly, a mine

of

of coal, lying beneath the former ſubſtances, and opened by ſeveral pits, which are in full activity.

This is a curious fact in natural hiſtory, and is worthy of profound inveſtigation. Had I known that I ſhould have met with ſo remarkable an object for ſtudious inquiry, I ſhould have certainly made arrangements for ſtopping a few days at Hearſthill, to trace with that attention which ſuch a ſubject requires, the diſpoſition and order of the ſeveral ſubſtances, and to meaſure their ſtrata. But as we had to reach Glaſgow that evening, I had time only to remark its ſituation. What I have ſtated, therefore, is to be conſidered as no more than a ſimple notice of the place, and an invitation to naturaliſts to direct their attention to ſo intereſting a phenomenon.

On our arrival at Glaſgow, our firſt buſineſs was to deliver ſome letters of recommendation, which we brought with us from Edinburgh; and we then went to ſee ſuch things as were moſt worthy of notice in the city. Natural hiſtory is not ſo much cultivated here as it is at Edinburgh; its commerce, which is very conſiderable, appear-

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ing to abſorb every other conſideration. The univerſity and printing-houſes of Glaſgow have, however, enjoyed a very high reputation, and it has produced ſeveral men of learning. We were told of a cabinet formed by Mr. Anderſon in the univerſity; we went to ſee it; but we found only a collection of the moſt common philoſophical inſtruments, and a few minerals which were in general little intereſting.

I was aſtoniſhed, in a climate ſo cold and ſo humid as that of Glaſgow, to ſee the greater part of the lower claſs of females, and even many of thoſe in eaſy circumſtances, walking about with their heads and feet bare, their bodies covered only with a jump, and a gown and petticoat of red ſtuff, which deſcended to the middle of their legs; and their fine long hair hanging down without any other ornament than a crooked comb to keep back that part which would otherwiſe fall over their faces. This garb of the females, ſimple as it may be, is not deſtitute of grace. As there is nothing to fetter their movements, they diſplay an elegance and agility in their gait ſo much the more ſtriking, as they are in general tall, well made,

and

and of a charming figure. They have a clear complexion, and very white teeth. It is not to be inferred, becauſe they walk barefooted, that they are neglectful of cleanlineſs; for it appears that they waſh frequently, and with equal facility, both their feet and their hands. In a word, the women of Glaſgow will be always ſeen with pleaſure by the lovers of ſimple nature. The children and young folks go alſo barefooted.

The vicinity of the mountains draws a great number of Highlanders to this city. Their antique veſtments, very much reſembling thoſe of the Roman ſoldiers, form a remarkable contraſt with the dreſs of the women and other inhabitants. I ſhall ſpeak in another place of this extraordinary garb, which is derived from a very remote period.

In the environs of Glaſgow there are conſiderable coal-mines of excellent quality. They make trade and manufactures proſper; and thereby increaſe the happineſs of the inhabitants.

The coal is found under beds of quartzoſe freeſtone, which, in ſome mines, are more than one hundred and forty feet thick; it adheres to the freeſtone, without any intermedium.

I en-

I endeavoured to diſcover impreſſions of fern or other plants in theſe mines. They are very rare; but after a careful examination of conſiderable heaps of ſubſtances brought up from the bottom of the mines, I obſerved, in a part of the freeſtone adhering to the coal, ſome very diſtinct portions of a large fern, which reſembled the American fern.

Pieces, compoſed of ligneous fibres, are alſo found in a kind of coal which the miners, on account of its variegated and changeable appearance, call *parrot-coal*. This coal is not ſo bituminous as the common kind, ſtains the hand leſs, takes fire more eaſily, and burns with a very bright flame; but it is not ſo durable.

The freeſtone which covers the coal-mines of Glaſgow, conſiſts, in general, of large quartzoſe particles. At no great diſtance from the city, and near ſome coal-pits there is a very extenſive open quarry of freeſtone. This excavation is very ancient, and conſiderable quantities of ſtone have been dug from it. The opening is, therefore, very large, and expoſes to the eye a full view of the interior of that maſs, to the depth of nearly eighty feet.

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It is diſpoſed in banks nearly in an horizontal direction, and more or leſs thick. But as the ſubſtance is entirely homogeneous, it cannot be known whether the lines of ſeparation have been produced by ſucceſſive depoſits, or whether they are merely the effects of ſhrinking.

The coal begins to appear at the depth of thirty feet from the ſurface, in ſcattered lines, running in an irregular manner through the midſt of the freeſtone. Then follow banks of the ſame ſtone, without the leaſt veſtige of coal. But as the beds deſcend, the coal reappears in ſmall, ſtraggling, and interrupted veins, from three to four inches thick. Theſe are again ſucceeded by an unmixed maſs of freeſtone, which falls through a depth of more than forty feet, and terminates in ſolid and continued beds of coal.

The quarry which I have mentioned did not admit of my tracing the order of the banks, and the diſpoſition of the ſubſtances, beyond the depth of eighty feet. But having deſcended into one of the neighbouring pits, ſunk through the ſame ſtone, I had an opportunity of making the above obſervations.

This ſtatement may be of ſervice to thoſe who,

who, from motives of public utility, are engaged in ſtudying the theory of coal-mines, and are deſirous of applying their knowledge to practice. The beſt coals, both in England and France, are ſuch as are found under freeſtone.

Let us ſuppoſe, for inſtance, that experience had not already aſcertained the diſpoſition of the ſubſtances in the coal-mines of Glaſgow, and that a pit were opened from above the freeſtone till the miners had reached the ſmall ſtraggling veins of coal;—if they ſhould follow, by a lateral courſe, this firſt indication, it is evident that they would be miſled. If, on the contrary, they ſhould continue to ſink the pit in a perpendicular line, they would diſcover a ſecond indication, conſiſting of ſmall veins, of a little more thickneſs than the firſt, though running alſo in an irregular manner. But as, in continuing to dig, they would have deſcended more than eighty feet, without meeting another indication, they might, at length, become diſguſted, and abandon the richeſt mines, when on the very verge of reaching them, by penetrating a few feet farther.

It is my opinion, that if it were poſſible

to procure topographical plans, executed according to drawings taken from nature, by men of competent experience, and exhibiting ſections of the moſt valuable and beſt known mines, it would greatly tend to the advancement of that uſeful art, and would, at the ſame time, throw light on the natural hiſtory of the ſubterraneous world.

The environs of Glaſgow preſent a fertile field of obſervation, by aſſemblages of pitcoal, freeſtone, calcareous ſtones, and volcanic productions, within very ſhort diſtances of each other. The lavas, however, occupy the higher parts of the ſoil; and they preſent ſuch intereſting varieties, that the greateſt part of the time which I ſpent at Glaſgow was employed in ſtudying them with attention, and in taking notes of thoſe objects which appeared moſt proper for enlarging that branch of natural hiſtory.

The volcanic zone, which comes from a diſtance, ſeems to be interrupted here. It was on our way out of the city, by the ſide of a water-mill, called the *Town Mill*, or more properly in the channel of the ſtream which turns it, that we obſerved the firſt products of a grand ſubterraneous combuſtion.

As

As cultivation, however, in the environs of a city, muſt have naturally changed the face of the ſoil, it is proper to recollect that cleared grounds, paſturages, and gardens, never permit us to ſee it in its primitive ſtate. But as this place preſents deep hollows and naked ſummits, inacceſſible to cultivation, it is to theſe original objects that the traveller ſhould direct his principal attention, becauſe they are the moſt ſtriking and leaſt doubtful in their appearances; and, becauſe they gradually conduct him to the foot of ſome ſteep, craggy rocks, where quarries of lava have been opened, which yield excellent ſtones for pavements. Near them are found various other kinds of lava, and volcanic currents of mud, to the formation of which water muſt have contributed as well as fire.

I purſued this courſe myſelf; and as the obſervations which I made may ſerve to direct the ſteps of naturaliſts a thouſand times better informed than I am, I ſhall here tranſcribe my notes, in the ſame form as I wrote them, without any other pretenſion than that of faithfully pointing out the different objects which appeared moſt worthy of attention.

The firſt volcanic hill, where I found ſome

priſms of very pure baſaltes, is ſituated at the extremity of a piece of water, near a bleach-field. The priſms are very large, and, though not of a perfect configuration, are tolerably well defined. This baſaltes is extremely hard and black, of a very fine grain, and of a ſubſtance ſo completely fuſed, that neither ſchorl nor any other extraneous body can be diſtinguiſhed in it. It ſtrongly attracts the magnet, and emits ſparks on being ſmartly ſtruck with ſteel. Its conſtituent moleculæ are ſo intimately united to each other, that time and the ſeverity of the climate have not injured in the leaſt, either the faces of the priſms, which ſtill preſerve their hardneſs and colour, or the entire of the maſs, which remains unaltered, and without any perceptible appearance of decay.

Paſſing thence to the oppoſite extremity of the ſame lake, that is, towards the end neareſt the public road, which is itſelf carried along a continuation of the preceding hill, the compact lava is no longer that beautiful, pure, and black baſaltes which I have juſt mentioned. It has much the ſame hardneſs; but it is intermixed with felt-ſpar of a greeniſh-grey colour, and a number of ſmall cryſtals

cryſtals of black ſchorl, in the form of ſtriated needles, ſeveral of which are in a ſtate of decompoſition. This lava is ſtrongly magnetic.

It is compoſed of ſmall priſms of well defined triangular, quadrangular, and pentagonal forms. Many of theſe priſms appear of a ſound and compact texture when broken, whilſt others have their cruſts impaired to a certain depth. This alteration is ſo much the more remarkable as it is progreſſive, and makes an uniform appearance on the different faces of the priſms. Thus, for example, if one of the unſound triangular priſms be broken equally and tranſverſely with a ſmart blow of a hammer, on inſpecting the fractured piece, it will be found that the decayed parts form a very exact triangular zone, ſpreading ſometimes ſeveral inches into the interior of the priſm, in ſuch manner, that on removing all that has undergone alteration, the ſound nucleus remaining will ſtill retain the ſame triangular form. This ſort of regular and ſymmetrical progreſſion in the alteration of the reſpective faces of theſe priſms, deſerved, in my opinion, to be mentioned here. It may intereſt thoſe naturaliſts whoſe ſtudies are principally

directed to the natural history of volcanic productions, and consequently to all the circumstances connected with their decomposition.

On descending to the foot of the craggy ridge, opposite to the town mill, and towards the tract watered by the stream which moves the mill, we saw a small quarry of granitic lava, which was intersected with several veins of calcareous spar, mixed with grains of quartz and martial pyrites. The lava itself also contained some pyritous spots, where it came in contact with the veins of calcareous spar. This mixture of calcareous spar and pyrites, which I had before remarked in lavas, almost always announces the vicinity of some crater, where the sulphuric acid, disengaged by the heat, rises in the form of elastic *gas*, combined with the aqueous fluid; whence there result decompositions and new aggregations, of which we should never have conjectured the origin, were it not for the striking instances afforded by the crater near Naples, where nature seems to operate, as it were, under our eyes.

I was recounting these instances to my fellow-tourists and observers, when William Thornton,

Thornton, whoſe eye is as penetrating as his judgment, exclaimed: "What you tell "us appears to me ſo true, that I think I "ſee, at a little diſtance, ſome diſcoloured "lavas, which may very probably preſent "to us the remains of an ancient crater."

We repaired inſtantly to the ſpot, and diſcovered a large extent, where the black compact lava is not only altered in its colour and hardneſs, but is ſo entirely diſcoloured and earthified, that it might be taken for a white clay. A few ſchorls have reſiſted this decompoſition, and are found unimpaired in the lava. Here, likewiſe, are ſeen all the different ſhades of the colouring principle, derived from iron, which, in its changes, has occaſioned reddiſh tints, and all the various modifications producible by the grand agent of nature.

Theſe diſcoloured lavas conducted us to other lavas in their vicinity, which had ſuffered leſs, but which preſented other appearances worthy of remark. We found ſome granitic lavas in the ſhape of balls, ſeveral of which were two feet in diameter, while others were no larger than a ſwan's egg. As they have undergone different de-

grees of alteration, they exfoliate, and ſeparate in the form of ſtrata; and, on being neatly broken into two, the nucleus appears ſound and entire, in a covering of ſmall foliated pieces of lava. Some of theſe balls are found in a detached ſtate; but the greater part are implanted in the ſolid maſs of lava.

But the moſt remarkable objects which I ſaw in the volcaniſed circle of the environs of Glaſgow, were very diſtinct priſms of granitic lava, of different ſizes, with well-ſhaped angles, leaning againſt each other, and, in general, of a quadrangular, pentagonal, or hexagonal form. Theſe priſms have ſuffered a peculiar alteration, which has attacked the aggregation of their component parts, or rather, which has diſſolved that union which conſtituted their hardneſs. Their angles are, conſequently, worn away; and it is ſingular that, in proportion as the angles are defaced, the central and moſt ſolid part aſſumes the form of a ball; ſo that the round maſſes ſeem to emerge from the middle of the priſms. I once ſaw ſomething of the ſame kind in the volcanos of Vivarais;

Vivarais; but the figures were not ſo ſtrongly marked as here.

Theſe preliminary and local obſervations have appeared to me neceſſary, to introduce a particular account of the volcanic objects which I collected in the environs of Glaſgow. I made an intereſting collection of theſe lavas, as well as of their principal varieties, to be ſent to France. But as it was poſſible that ſome accident might befall them before reaching their place of deſtination, I drew up, on the ſpot, a ſuccinct catalogue of them, arranged according to the numbers which I paſted on each article. I ſhall, at leaſt, preſerve, in caſe of any miſchance, the remembrance of a number of objects which ſtrongly intereſted me; and by thoſe means, I may put naturaliſts in the way of proſecuting the ſame inquiries, and of giving a greater intereſt and expanſion to their labours.*

* It will be ſeen in the ſequel, that this apprehenſion for the fate of my collections was not groundleſs. I, therefore, allow the minute of the ſpecimens, which I collected at Glaſgow, to keep its place here.

VOLCANIC

VOLCANIC PRODUCTIONS OF THE ENVIRONS OF GLASGOW.

Basaltic Lavas.

No. 1. A triangular priſm of baſaltic lava, black, hard, and magnetic.

No. 2. Priſmatic quadrangular baſaltes; part of which is a compact, black, hard, and magnetic lava, and of a homogeneous paſte, unmixed with any extraneous body, whilſt the other part of the ſame priſm conſiſts of a compact porphyric lava, of a blackiſh bottom, and interlarded with ſmall irregular cryſtals of black ſchorl and reddiſh felt-ſpar. This priſm, which is only eight inches long, and two and a half inches broad, is the more curious, as it is a ſpecimen of a lava, the primitive matter of which ſeems to have belonged to a rock of trapp having a porphyric baſe; ſince a portion of this remarkable priſm bears the marks of porphyry, and another thoſe of trapp. I had before remarked in original rocks the converſion of trapp into porphyry by the addition of felt-ſpar; but it requires a very happy concurrence of circumſtances to diſcover the ſame appearance in a compact lava of the priſmatic form;

form; and, under this point of view, this beautiful ſpecimen is worthy of remark.

No. 3. Pentagonal priſmatic baſaltes, of the moſt perfect regularity in its five ſides; pure, black, hard, and attractive of the magnet.

No. 4. Slabbed baſaltes; black, hard, magnetic, of a very fine grain; and with a few points of black ſchorl diſtinguiſhable in its texture.

No. 5. Black compact lava; the colour of which has been impaired by the action of ſome elaſtic gas, or rather by that of an aqueous fluid, loaded with ſome principle, which, by attacking the ferrugineous particles of this lava, has deſtroyed their attraction for the magnet. This ſpecimen is remarkable by its adherence to a ſmall bottom of calcareous ſtone. I picked it up near the rock which ſkirts the ſtream of the town mill.

No. 6. Baſaltic lava, which has loſt its colour, and become white, preſerving, however, a portion of its hardneſs, and eſpecially its rough and dry grain.

No. 7. Another compact baſaltic lava, ſo altered, that its ſubſtance is not only very white, bnt likewiſe ſoft and tender to the touch,

touch, like clay. Some ſmall priſms, however, have ſtill preſerved their form.

GRANITIC, OR PORPHYRIC, LAVAS.

No. 8. A triangular priſm, compoſed of a lava, the black texture of which is ſomewhat ſcaly, and intermixed with irregular lamellated grains and pieces of reddiſh felt-ſpar, and a few ſmall dots of quartz. This lava, which is ſtrongly magnetic, ſeems to have for its baſis a black trapp, compoſed of ſcaly particles, or more properly, a horn-blend, or rock, ſchorl; its fracture appears ſolid and ſound, and it is ſuſceptible of a fine poliſh.

No. 9. Another triangular priſm, of a deep iron-grey colour, having its texture intermixed with a number of ſmall parallelopipedal white glittering cryſtals of felt-ſpar, and with ſmall irregular plates of the ſame matter, and of a ſimilar luſtre and colour. This priſm, which is of a regular, well-defined form, has ſuffered an alteration in its exterior parts to the depth of three lines. But this alteration has nowiſe defaced it; the colour is changed, and the ſurface may be more eaſily cut through, but it remains very hard

hard in the centre. The change of the particles has proceeded ſo equally and uniformly on all ſides of the priſm, that the colour which it has produced touches that of the unaltered part in right lines; ſo as, on viewing the priſm at one end, to exhibit the appearance of one triangle incloſed in another, of a different colour. The ſound part is magnetic; the altered part is not.

No. 10. Granitic lava of a black baſis, mixed with a great number of ſmall cryſtals of yellowiſh felt-ſpar. One of the faces of this ſpecimen is covered with a layer of calcareous ſpar, of a roſy colour, and alſo with a thin ſtratum of white quartz, which forms a tranſparent varniſh above the calcareous ſpar.

No. 11. The ſame lava with No. 10, intermixed with a few pyritous ſpecks, and having a layer of white calcareous ſpar on one of its faces.

No. 12. The ſame lava, blended with a number of ſharp points of black ſchorl.

No. 13. Granitic lava, which ſeems to conſiſt of a yellowiſh-white felt-ſpar, and black pointed ſchorl: theſe two ſubſtances appeared to enter in equal proportions.

No. 14.

No. 14. The ſame lava as the above; but containing a greater proportion of black ſchorl than of felt-ſpar. The ſchorl is formed into long prickles of a ſhining appearance, but ſomewhat defaced by the action of fire. It attracts the magnet.

No. 15. Compact granitic lava, of a greeniſh colour, with ſome cryſtals of felt-ſpar and laminæ of mica. This lava acts very powerfully on the loadſtone.

No. 16. Lava of the variety, No. 10, containing ſome cryſtals of garnet, of twenty-four trapezoidal faces, of a greeniſh-grey colour, and very much reſembling thoſe found on Veſuvius. This is the firſt time that I have ſeen this kind of garnet in any other lava than thoſe of Veſuvius. I have never met with it in the volcanic products of Ætna, of the Iſle of Bourbon or Iceland, nor in thoſe of Auvergne, Vivarais, Velay, the banks of the Rhine, &c. I found near Glaſgow only two ſpecimens of the lava containing theſe garnets; M. de Mecies picked up a third. The cryſtals are in the moſt perfect preſervation.

No. 17. Priſmatic porphyric lava, in which there is a great proportion of dull white felt-ſpar,

ſpar, and black pointed ſchorl. The ſchorl has loſt its luſtre, and the baſis of the lava is changed into an ochrous, friable, and tender ſubſtance, which may be bored and even cut with eaſe. But the lava, notwithſtanding its advanced ſtate of decompoſition, is ſtrongly attractive of the magnet. This may be owing to the ſchorl, which is not ſo much altered.

No. 18. A round ball of porphyric lava, formed into concentric layers by decompoſition. Some balls of this kind had as many as ſeven layers, which were exfoliated, and could be eaſily detached from each other; whilſt the part which had undergone no alteration, and which formed the nucleus, was of a compact, hard texture, and had no appearance of being ſtratified.

Such are the volcanic products which I collected in the environs of Glaſgow, during the three days that I ſpent in theſe reſearches without information or conductor. I ſhould wiſh to have been able to devote a longer ſpace to this employment, which ſtrongly excited my curioſity; but it is more than ſufficient to put others in the way of perfecting the feeble outline which I have ſketched.

ſketched. I ought not to omit mentioning, that I found on the higheſt of the hills in the vicinity of Glaſgow, among ſome rounded lavas, ſeveral blocks of a quartzoſe ſtone intermixed with mica, and containing ſome twelve-ſided garnets, of a ſomewhat coarſe texture, but of a very regular configuration. Theſe blocks of micaceous quartz, which are found diſperſed in different directions, have been forcibly carried along with the lavas, by the effect of ſome convulſion. But as they are of conſiderable bulk, and as it is conſequently probable that they have not been tranſported from a very great diſtance, they may afford ſome indications of the primordial rocks from which they have been torn by a volcanic exploſion.

It would be nowiſe ſurpriſing to find that they have been diſcharged from a very conſiderable depth. Veſuvius affords inſtances of particular ſtones, which it throws out in ſome of its eruptions, that have no reſemblance to any ſubſtance found in its environs, nor within a great diſtance of it. The quartzoſe ſtones intermixed with garnets here mentioned, may be ſuppoſed to have had a ſimilar origin, if there ſhould not be

diſcovered

diſcovered in the vicinity of Glaſgow, or within a conſiderable length of it, any rocks of which they might have formed a part.

Here I ought to ſtate a difficulty which I experienced in my examination of thoſe lavas of the environs of Glaſgow, which I have termed granitic and porphyric lavas.

Theſe lavas undoubtedly conſiſt in ſome caſes of the former, and in others of the latter of theſe compound ſtones; and there were inſtances in which I could make the diſtinction, without any apprehenſion of being deceived, when their characteriſtic differences were apparent. But as the long-continued action of fire, with that of various emanations of gas, have altered and often deſtroyed the conſtituent principles of theſe lavas, preſerving, however, ſome characters common to granites, and porphyries, ſuch as cryſtals of felt-ſpar or ſchorl, I muſt have neceſſarily laboured under conſiderable embarraſſment and uncertainty. As the baſis, however, of ordinary porphyries is compoſed of thoſe particles which conſtitute trapp, or hornſtone, and as this baſis readily enters into fuſion, it may be diſtinguiſhed with a little practice. But when the emanations

have acted on this baſis, and deſtroyed its coheſion, and when the ſame cauſe has produced the ſame effect on the granites, the caſe becomes much more difficult and embarraſſing. I have probably, however, ſaid too much upon a ſubject which can intereſt only one claſs of readers.

Our harveſt in natural hiſtory being finiſhed in this quarter, we made preparations for our departure for the Highlands; and as no relays could be got on the Inverary road, we hired horſes and drivers to be kept during the remainder of our journey.

I forgot to mention that we brought a draughtſman with us from Edinburgh, to take ſuch views as ſhould appear to us the moſt important towards the advancement of the natural hiſtory of volcanos in that part of the Hebrides which we intended to viſit.

CHAPTER X.

Departure from Glaſgow.—Dumbarton.—Volcanic Subſtances.—Loch-Lomond.—Luſs.—Tarbet.—Loch-Fhyne.—Inverary.—Inverary Caſtle.—Its Parks and Gardens.—Natural Hiſtory.—Departure from Inverary.

ON the afternoon of the 14th of September we left Glaſgow for Dumbarton, where we had reſolved to ſleep that night. When we arrived, we found there was a fair in the town, which made it extremely difficult to procure beds in the inns, as they were full of ſtrangers. Here the traveller muſt bid adieu to all traces of the Engliſh neatneſs: he meets with very different manners and cuſtoms; but he who is in ſearch of information eaſily accommodates himſelf to every thing. The barley and oats were not yet ripe, ſo little advanced was the harveſt at Dumbarton.

This little town ſtands upon an arm

of the ſea into which the Clyde, which flows paſt Glaſgow, falls. It is defended by a ſmall fort, built upon a ſteep volcanic and ſolitary precipice, which has two ſummits. I know not why Mr. Pennant, in ſpeaking of the rock on which Dumbarton caſtle ſtands, ſhould ſay that its height is ſtupendous. I found that it did not exceed two hundred and fifty feet.

It is formed of a blackiſh baſaltic lava, which is hard, magnetic, and of a fine grain. This lava has, in general, a tendency to a priſmatic form; but, with the exception of ſome ſmall priſms, which are occaſionally to be found, the principal maſſes preſent ſketches only of pillars.

The only part of the hill which deſerves the particular attention of naturaliſts is that which fronts the town. There will be found in it:

1. A current of muddy lavas, which includes a number of fragments of baſaltes, more or leſs altered: this current is croſſed by ſome veins of calcareous ſpar, a work of infiltration.

2. In the ſame current there may alſo be obſerved

obſerved a ſmall quartzoſe zone, of a dull white colour, mixed with roſe-coloured calcareous ſpar.

3. A thick vein of dark argillaceous ſchiſtus, which breaks into plates.

I believe that theſe laſt ſubſtances are ſtill in their primitive place, and have eſcaped the action of the lavas which appear in the midſt of them. They may be conſidered as teſtimonies that volcanoes have here exerciſed all their fury upon ſchiſtous rocks, ſomewhat mixed with mica, and croſſed in ſome places by girdles of quartz.

In our excurſions round Dumbarton, we ſaw immenſe collections of baſaltes reduced into fragments. Theſe hard black lavas thus broken, and heaped one above another, form little hills. It is really aſtoniſhing to ſee ſuch great accumulations of lavas in fragments, particularly as they appear at about a mile from Dumbarton, on the road to Glaſgow, where they form a vaſt cauſeway, which joins at a diſtance to more elevated hills.

We were told that theſe were remains of a wall of aſtoniſhing magnitude, which the Romans were obliged to erect in the time of Agricola, to ſecure themſelves againſt

the incurſions of the invincible Caledonians, whom theſe conquerors of the world were never able to ſubdue.

I know that ancient authors ſpeak of this famous wall, and ſtate that it was repaired by order of the emperor Adrian, upon which account it has been called *Vallum Adriani*; but according to them this was not its ſituation *. It is, however, true that Lollius Urbicus, Adrian's lieutenant, paſſed the wall of Agricola, and drove the Caledonians beyond the Clyde, where he formed a chain of fortifications †. Dumbarton is very near the Clyde, and the Roman wall, which tradition places here, was probably erected by Lollius.

It is not ſurpriſing that the Romans ſhould take advantage of a poſition ſo favourable for erecting redoubts, which muſt have been very eaſily conſtructed, ſince nature has defrayed the principal part of the expence, by furniſhing innumerable materials, accumulated by the active force of volcanoes, and forming themſelves into a formidable barrier.

* The beſt maps delineate this line of circumvallation from Newcaſtle to Carliſle.

† Capitolin in Antonin.

I employed

I employed more than two hours in examining this kind of natural cauſeway, in which I obſerved only baſaltic hills, reduced into fragments, without being able to diſcover the ſmalleſt work of art. It is poſſible, however, that military works may have exiſted here; and, perhaps, the Romans had conſtructed the redoubts of dry ſtone, without mortar. It is not ſurprizing that all traces of them are now effaced, ſince works of the ſame kind formed during the wars of Lewis XIV. can now ſcarcely be diſtinguiſhed.

In the excurſion which I made to the diſtance of two miles round Dumbarton, my collection was confined to baſaltic lavas, containing ſome globules of calcareous ſpar, and a lava of a muddy nature, to which there was attached a fine piece of zeolite, of a colour inclining to green.

There is alſo not far from the town freeſtone, in its primitive ſituation, of a red colour, and which appears to have been touched by fire. This diſcovers the ferruginous principle with which it is coloured.

We left Dumbarton at five o'clock in the evening, intending to ſleep at Luſs, on the

banks of Loch-Lomond, as we wiſhed to have an opportunity next morning of examining at our eaſe that beautiful lake, and its little iſlands, which are about twenty in number, and on ſeveral of which there are ſome charming habitations. This is a freſh-water lake, and the largeſt in Scotland. It is twenty-eight miles in length, and is regarded as one of the wonders of the country.

We found that the volcanic ſubſtances diſappeared, as we approached the lake. They were at firſt ſucceeded by calcareous ſtones, afterwards by granitic ſchiſtus, and by micaceous *kneiſs*. But we had ſcarceely proceeded a mile on the banks of the lake when night came on, and deprived us of the proſpect: we ſaw only a few iſlands, which appeared very picturesque. It was ten o'clock when we arrived at Luſs. This place being marked on the map, I expected that it was a village, or at leaſt a hamlet. It was, however, only one houſe, and ſuch a miſerable habitation, that I believed I was entering into a fiſhing hut: but our aſtoniſhment was great indeed, upon obſerving that ſigns were made us not to ſpeak, which

ſeemed

ſeemed to ſignify that there was a perſon ſleeping, whoſe repoſe we ought not to diſturb. We believed there was ſome perſon very much indiſpoſed in the houſe, for this was what the expreſſive geſtures of the miſtreſs and three ſervants ſeemed to announce. We therefore did not venture to open our mouths, but what we wanted ſeemed to be underſtood: we were, however, conducted, or rather driven, into a kind of ſtable, where we received an audience; indeed, it was not a long one. *The juſticiary lords*, ſaid the hoſteſs, *do me the honour to lodge here when they are on this circuit. There is one of them here at preſent. He is aſleep, and nobody muſt diſturb him. His horſes are in the ſtable; ſo you ſee there is no room for yours, and it is needleſs for you to ſtay.—But miſtreſs*, ſaid one of our drivers, for we durſt not venture to ſpeak, *look at our poor horſes, and conſider this terrible rain. —How can I help it*, replied ſhe. We went off, and ſhe ſhut the door after us, and double-locked it; but firſt called out to us, *Make no noiſe: his lordſhip muſt not be diſturbed. Every body ſhould pay reſpect to the law. God bleſs you—farewel.*

We

We could not avoid laughing at this laconic kind of eloquence, which admitted of no reply, and this ſingular mode of ſhewing reſpect for a judge. We were, however, obliged to proceed on our journey, feeling much more for our poor drivers, and the horſes, than we did for ourſelves.

Unluckily we had ſtill to travel fifteen miles in a dark and ſtormy night, along the banks of the lake, before we could meet any habitation. Never in my life did I make ſo diſagreeable a journey, nor one which appeared ſo long.

Our horſes, though good, were fatigued, and with difficulty carried us forward. Our drivers wiſhed all the judges in Scotland a hundred times to the devil, and laviſhed a hundred curſes on the landlady of Luſs. We endeavoured to conſole them in the beſt manner we could, by promiſing them a recompence, which indeed they juſtly earned; for they were wet to the ſkin, with a cold rain. At laſt we got to the end of our tedious and painful journey, arriving at half paſt three in the morning at a place called Tarbet, which was alſo a ſingle houſe.

The people of the houſe roſe very readily

dily at the call of our poſtillions, and our horſes were put into a ſtable. Fortunately there was no judge here, but there were jurymen on their way to Inverary, who, having arrived before us, occupied all the beds by the right of priority. We were, however, happy that our horſes were ſheltered. We were kindly received, got ſomething to eat, and ſome excellent tea, which greatly refreſhed us.

The eaſy manner in which we put up with our bad accommodation intereſted the landlady; and when ſhe learned that we intended to paſs the remainder of the night in our carriages, ſhe kindly offered us two mattreſſes from her own bed, obſerving, that ſhe had had enough of ſleep, and would not go to bed again. We thankfully accepted them. Count Andreani preferred ſleeping in his carriage. M. de Mecies had one mattreſs to himſelf, and Thornton and I ſhared the other. We ſlept there three hours wrapped up in plaids, and our fatigue was removed.

A fine day ſucceeded to this diſmal night. The ſun was brilliant and warm; the ſky a fine azure. We breathed the pureſt air on the

the banks of Loch-Lomond, and ſaluted the nymph who preſides over its beautiful waters.

From this point of view the appearance of the lake is truly ſuperb, though only a part of it can be ſeen, on account of its great extent. It is interſperſed with little iſlands, ſeveral of which are only barren rocks, but others are cultivated, and the woods and hills are grouped in a very pictureſque manner. Our glaſſes enabled us to ſee ſome larger iſlands in the diſtance.

The banks of that part of the lake which was near us were compoſed of micaceous ſchiſtus, the lamellæ of which appeared in the ſhape of rods, undulating and ſhining as if ſilvered. A great variety of moſſes, in flower, formed verdant caves in the hollows of the rocks, while the more elevated parts exhibited a fine paſturage, and were covered with black cattle and ſheep. The ſhepherds, ſeated under large firs, and eaſily diſtinguiſhed by the variegated colours of their Tartan dreſs, gave life to this magnificent rural ſcene, where peace and tranquillity ſeemed to reign. This beautiful proſpect forms a fine contraſt with the ordinary

dinary aſpect of the mountains of Scotland, which is rendered ſo ſevere by the ſombre colour of the heath, and by the characteriſtics of ancient volcanoes in thoſe places where lavas abound.

We now regretted much that we did not find beds at Luſs, where we might have embarked on the lake, viſited ſome of the iſlands, and arrived at Tarbet by water; but we had no more time to ſpare for an excurſion of this kind. It was neceſſary that we ſhould proceed on our journey. After walking about for an hour and a half, we returned to our inn, where a breakfaſt of tea was prepared for us and in laying out which our hoſteſs had diſplayed a little hoſpitable vanity. She had arranged her china on a neat little varniſhed tea-table, which was covered with every thing requiſite for an elegant country breakfaſt. This good woman, who was a widow, poſſeſſed all the ſimplicity of manners, ſenſibility and gratitude, which diſtinguiſh the inhabitants of the Caledonian mountains. She informed us that ſhe ſet more value on this little equipage than all the reſt of her furniture, ſince ſhe had received it from the ducheſs of Argyle, who

who ſtopped at this inn on her way to Inverary. She praiſed highly the goodneſs and generoſity of this noble lady, and gave us a long hiſtory and eulogium of her ancient family.

Perſons of fortune can eaſily make themſelves beloved, and render others happy, at a ſmall expence. Why then is this conduct ſo ſeldom adopted? Becauſe it is more the offspring of nature than education; and the ruling inclination every where governs men. From the ſtories this good woman told us of the houſe of Argyle, and the tone in which they were delivered, I was convinced that this family is naturally good, diſtinguiſhed by excellent qualities, and that in whatever ſituation fortune had placed them, they would have diſplayed the ſame amiable character. Philoſophy has not ſufficiently ſtudied the paſſions with regard to nature. Though every thing cannot be aſcribed to them, they certainly have a very powerful influence in the formation of human character.

The magnificent ſcenery of Loch Lomond, the fine ſun that gilded its waters, the ſilvered rocks that ſkirted its banks, the flowery

flowery and verdant moſs, the black oxen, the white ſheep, the perfume of the tea, given with kindneſs, and received with gratitude, will never be effaced from my memory, and I ſhall ever cheriſh the deſire of reviſiting Tarbet before I die. Even among the oranges, the myrtles, the laurels, and the jeſſamins of Italy, I ſhould often meditate on the wild and romantic beauties of Loch-Lomond.

But let us proceed upon our journey. I ſoon found a contraſt to the delightful ſcenes we left. They were ſucceeded by diſmal heaths. We entered a narow paſs between two chains of high mountains, which appear to have, at a very remote period, formed only one ridge, but which ſome terrible convulſion had torn aſunder throughout its length.

This defile is ſo ſtrait, and the mountains are ſo high and ſteep, that the rays of the ſun ſcarcely penetrate it. Indeed, the ſun is here only ſeen for the ſpace of an hour in the twenty-four. For more than ten miles, which is the length of this paſs, there is neither houſe nor cottage, and not an animated being to be ſeen, except a few fiſhes in a ſmall lake, about half way. I do not mention

mention the flocks of ſheep or goats that feed on the mountains, becauſe they are at ſo great an elevation, that neither their ſhape nor their motion can be diſtinguiſhed; and they appear more like round ſtones than living animals. It is impoſſible to tell what they are by the naked eye.

We were nearly ſix hours in this diſmal paſſage, the road through which is almoſt impaſſable; at laſt it ſuddenly opened on Loch-Fyne, in Argyleſhire. The firſt village we arrived at was Cairndow, on the extremity of the lake. We went round this point of the lake, and arrived at Inverary, the capital of Argyleſhire. Though this be the chief town of the county, it would only be called a village in France; but it is charmingly ſituated upon the ſide of the beautiful Loch-Fyne, which may be navigated by large veſſels. This lake alſo abounds with herring; and the fiſhery, which annually takes place upon it, employs a great number of veſſels, and yields a conſiderable revenue. Here there is the view of ſome paſture-grounds and trees in a valley, which terminates in a fine park, ſkirted by variegated gardens, meadows covered with

with flocks, and hills planted with green trees. At the bottom of this landſcape ſtands a magnificent habitation, in the Gothic ſtile. It is Inverary caſtle, the reſidence of the Duke of Argyle.

It was from the door of the only inn in the village we enjoyed this fine proſpect. Our carriages were already within the yard, when the maſter came out, and very politely informed us, that we could not be received, as every room in his houſe was either engaged, or already occupied. The judge who had diſappointed us at Luſs was, it ſeems, expected here, and the beſt room was very properly reſerved for him: the jurymen were in poſſeſſion of the reſt of the houſe.

We had letters of recommendation to the Duke of Argyle, and we underſtood that he had arrived at Inverary, where he intended to paſs the autumn; but we did not chooſe to wait upon him until we had procured lodgings for ourſelves, as we ſhould have been ſorry to abuſe any kindneſs that might be ſhewn us.

The inflexibility of the innkeeper, however, embarraſſed us greatly. He would not

receive our baggage, nor allow us to enter his houſe. Our only alternative was to proceed to Dalmally, about fifteen miles from Inverary; but it was already too late for undertaking a journey, which would have obliged us to travel through very bad roads, during the night. Beſides, we ſhould have loſt the opportunity of ſeeing the Duke of Argyle, delivering our letters, and receiving from him information reſpecting the country, and the difficult route we had ſtill to purſue before we could arrive at Oban.

Theſe conſiderations induced us to aſk the innkeeper, if he would permit us to ſtep into a room, and write a letter to the Duke of Argyle. The name of his grace is here held in the greateſt veneration; and we had no ſooner mentioned it, than every thing we aſked for was granted. In preſenting our reſpects to the Duke, we ſtated our ſituation, and, at the ſame time, expreſſed our reluctance to give him any trouble on that account. To this billet we joined our letters of recommendation, and an expreſs was inſtantly diſpatched with the packet. We ſoon received an anſwer, by a French painter, who, at this time, was employed in

Inverary

Inverary caſtle. He informed us, that we were anxiouſly expected at the caſtle, and begged us to come juſt as we were, as the family would not ſit down to dinner till we arrived. Servants were, at the ſame time, ſent to take care of our carriages.

On our way to the caſtle, we ſaw the Duke's eldeſt ſon, who came to meet us with all the demonſtrations of the moſt engaging politeneſs and generous affability. When we arrived at the houſe, we were received with every mark of friendſhip by this amiable family, who, to the accompliſhments that belong to their high rank, join all thoſe finer qualities that ſpring from the feeling hearts and elevated minds, which the *truly well-born* only poſſeſs. After the firſt compliments, we placed ourſelves at the dinner-table. Every thing pleaſed and intereſted me in this houſe, in which, if I may uſe the expreſſion, there ſeemed to reign a fine kind of ſympathy, that every where diffuſed happineſs. I ſaid to myſelf—*The good woman of Tarbet has not deceived me—This is a charming family.* French was ſpoken at this table with as much purity as in the moſt poliſhed circles of Paris. They did not fail to en-

quire the motives of our journey to a place ſo little frequented by ſtrangers as this diſtant part of Scotland; but their ſurprize ſoon ceaſed, when we informed them, that we intended to go to the Iſle of Staffa, and viſit the far-famed cave of Fingal.

If I recollect right, the Duke informed us, that Sir William Hamilton, and his nephew, Lord Greville, had undertaken the ſame journey, without having found a day favourable for the ſhort paſſage between the main land and Staffa. As this craggy iſland has neither port nor road, and can only be approached by ſmall boats, a calm ſea, and the proſpect of a continuance of fair weather, are abſolutely neceſſary, before an attempt be made to viſit it. Theſe, however, ſeldom occur upon this coaſt, which is ſtrewed with iſlands, waſhed by a variety of currents, and expoſed to the moſt impetuous winds.

To ſhorten the paſſage by ſea, we were adviſed to proceed from Oban up the Sound of Mull to the iſland of that name: to croſs the iſland to Toroliſk, where we ſhould find the houſe of Mr. M'Lean, a very worthy gentleman, to whom the Duke of Argyle promiſed to give us letters of recommendation.

tion. From Toroliſk to Staffa the paſſage is very ſhort. We might go there and come back to the iſland of Mull in one day, by ſetting off early, and returning at night: but even for this little voyage it required one of thoſe fine days which we had little reaſon to expect at a ſeaſon already too far advanced: we were, however, told, that we might be fortunate enough to have ſome good weather even in autumn, and that to have arrived a little ſooner, would have been no advantage to us, as the ſtormy period in theſe ſeas had commenced ſome months before.

The Duke of Argyle kindly ſaid, that he wiſhed to have the pleaſure of detaining us with him for a few weeks, that we might have an opportunity of viewing the country, and examining ſuch of the neighbouring mountains as were particularly worthy of obſervation. But, preſſed for time, we could only promiſe to ſtay three days, which, if well employed, would, we thought, be ſufficient to enable us to ſee every thing remarkable in the neighbourhood of Inverary, particularly ſome hills and quarries, which

appeared chiefly to deserve our attention. We therefore resolved to prosecute these studies early in the morning, and to employ the evening in that social intercourse, which would give us an opportunity of becoming more intimately acquainted with a family so hospitable, so well informed, and every way so amiable.

We remained, of course, three whole days in this delightful retreat, devoting the mornings to natural history, and the evenings to music and conversation. As the gentle and polished manners of the master and mistress of the house, as well as the excellent dispositions and promising talents of the younger part of the family, greatly interested me; and as I also saw here some of those customs which characterize the Scottish frankness and hospitality, I shall give a rapid sketch of my observations and remarks. They naturally ought to precede the account I have to give of the mineralogy of the environs of Inverary.

Inverary castle is entirely built of a grey-coloured *lapis ollaris*, soft to the touch, capable of receiving a fine polish, and every form

form that the chiſel can give: though delicate, it reſiſts the weather, at leaſt as well as the hardeſt marble.

One is at firſt ſight ſurpriſed that a caſtle, in appearance ſo ancient, ſhould exhibit no marks of decay: every thing is ſo well finiſhed, the angles are ſo clean and ſo perfect, and the colour of the ſtone is ſo equal, that the building ſeems to have juſt come from the hand of the workman.

My aſtoniſhment on this ſubject, however, ſoon ceaſed, when, after croſſing ſome drawbridges, and paſſing through a gateway, the ſtyle of which was as Gothic as that of the age of Charlemagne, I arrived at a veſtibule, which conducted me to an Italian ſtaircaſe, with double balluſters, and of the moſt perfect architecture.

This veſtibule was ornamented with large bronze vaſes, of antique forms, placed on their pedeſtals, between the columns. Theſe vaſes ſerved, at the ſame time, as ſtoves to warm the veſtibule and the ſtaircaſe.

The whole of this part of the building is magnificent, richly decorated, and ſkilfully lighted. The ſteps are covered with elegant carpets, and every thing announces a refined

and exquiſite taſte. There appears, however, to have been a deſire to exhibit even here ſome traces of the Gothic. To produce this effect, there is ſeen in the perſpective of the ſtaircaſe, a large niche, ornamented with Gothic columns, and which contains the caſe of an organ: this gives a ſolemn and religious air to the place. The contraſt occaſioned by this oppoſition of ſtyle may appear abſurd in theory, but there is here a charm in the execution, which renders it very agreeable.

The other parts of the houſe are laid out in a manner equally elegant and commodious, and are capable of containing a numerous family. Throughout the whole, the luxury of ſimplicity, and the extreme of neatneſs, have, as they always ought in a country reſidence, been much more ſtudied than the pomp of gildings, or ſumptuous furniture.

Notwithſtanding the antique appearance of this caſtle, it is really a modern building. A Gothic exterior, joined to an elegant diſtribution within, was preferred, becauſe the buildings of the tenth century have a good effect in the midſt of woods, and at the foot

of

of hills. They recal the chivalrous ideas which are connected with the bravery and gallant adventures of thoſe romantic times. Theſe recollections diffuſe a ſort of charm over the ſcene: they embelliſh it, and render it peculiarly intereſting: there are few who do not find ſomething pleaſing in the age of romance.

The parks, in which native and foreign trees are intermixed, are very extenſive, and have the fineſt effect: open ſpaces are left, covered with the moſt beautiful verdure, and roads and bye-ways are cut, which lead to gardens, green-houſes, ſheep-folds, and ſequeſtered woods, on the ſides of hills, the banks of rivulets, or towards the ſhore of an arm of the ſea*.

The inhabitants of the caſtle, at this time, were:—the Duke of Argyle, one of the moſt amiable of men, and who had travelled in France and Italy:—his Ducheſs, who was formerly married to the Duke of Hamilton: ſhe paſſes, and I believe juſtly, for having

* Knox, who was at Inverary two years after me, in ſpeaking of that place, ſays: "Inverary has become of ſome "importance, by the care of the family of Argyle, who have "a magnificent houſe there, ſurrounded with more than a "million of trees, which occupy ſeveral miles ſquare."

been

been one of the fineſt women in Great Britain: ſhe is certainly one of the beſt informed. — The Counteſs of Derby, the Ducheſs's daughter, by her firſt huſband: this lady had travelled a great deal, and ſpoke French with ſo much facility and correctneſs, that ſhe might have paſſed for a native of Paris: there are few women more beautiful, or more accompliſhed. — The children of the Duke. The eldeſt daughter played excellently on the piano-forte, and ſhe, as well as her two younger ſiſters, was handſome and lovely. The Duke's ſon was, at this time, about ſixteen or ſeventeen years of age, and already ſhewed much taſte in drawing. A phyſician and a chaplain formed a part of the family eſtabliſhment. There were alſo ſeveral viſitors in the houſe, among whom was a member of parliament, a man of talents, who had travelled, with advantage, in every part of Europe.

I muſt not omit to mention, that on the ſecond day after our arrival, the judge, on whoſe account we had been put to ſo much inconvenience, came to dine at Inverary caſtle. He was a good honeſt Scotſman, ſomewhat advanced in years, and he truly deſerved

deſerved all the reſpect and attention that had been paid to him, for he exerciſed his office with juſtice and humanity. We made our peace with him in the manner of the country—in the midſt of toaſts; and he aſſured us, with great good-nature, that he would have ſhared his lodging with us, if he had known what paſſed, and that if he ſhould have the pleaſure of meeting us another time upon the road, he ſhould not be the means of depriving us of beds.

The manner in which we ſpent our time at Inverary caſtle was extremely agreeable. Each perſon roſe at any hour he pleaſed in the morning. Some took a ride, others went to the chace. I roſe with the ſun, and proceeded to examine the natural hiſtory of the environs.

At ten o'clock, a bell ſummoned us to breakfaſt: we then repaired to a large room, ornamented with hiſtorical pictures of the Argyle family; among which there were ſome by Battoni, Reynolds, and other eminent Italian and Engliſh painters. Here we found ſeveral breakfaſt tables, covered with tea, coffee, excellent cream, and every thing the appetite could deſire, ſurrounded with bouquets

bouquets of flowers, newſpapers, and books. There were, beſides, in this room, a billiard-table, a piano-forte, and other muſical inſtruments.

After breakfaſt, ſome walked in the parks, others amuſed themſelves with reading and muſic, or returned to their apartments. At half paſt four, the dinner bell was rung, and we went to the dining-room, where we always found a table of twenty-five or thirty covers. When all the company were ſeated, the chaplain, according to cuſtom, made a ſhort prayer, and bleſt the food, which was eat with pleaſure. Indeed, the dinners were prepared by an excellent French cook, and every thing was ſerved up in the Paris manner, except a few diſhes in the Engliſh form, which made a variety, and thus gave the epicures of every country an opportunity of pleaſing their palates.

I was particularly pleaſed to ſee napkins on the table, and forks of the ſame kind as thoſe uſed in France. I am not much diſpoſed to riſk pricking my mouth or my tongue with thoſe little ſharp ſteel tridents which are generally uſed even in the beſt houſes of England. I know that this kind

of

of forks are only intended for ſeizing and fixing the pieces of meat while they are cut, and that the Engliſh knives being rounded at the point, may anſwer for ſome of the purpoſes to which the French forks are applied, particularly in carrying meat to the mouth; but, I muſt confeſs, that I uſe their knives very awkwardly in this way. It is well, however, to accuſtom one's ſelf to the uſages of different countries; and it ſeemed to me that at table, as well as in ſeveral other inſtances, the Engliſh calculate more accurately than we do.

In England, the fork is always held in the left hand, and the knife in the right. The fork holds the meat down, the knife cuts it, and the pieces may be carried to the mouth with either. The motion is quick and preciſe. The manœuvres at an Engliſh dinner are founded upon the ſame principle as the Pruſſian diſcipline—Not a moment is loſt.

In France, the firſt manœuvre is ſimilar to that of the Engliſh; but when the meat is cut in pieces, the knife is laid down on the right ſide of the plate, and the fork is changed from the left to the right hand, with which it is lifted to the mouth: thus

our

our table tactics are more complex than the Engliſh, and require more time. The Engliſh method is certainly the beſt; but large knives, with rounded points, are neceſſary to put it in practice. And why not have them? There would then be an arm leſs in the hands of the vicious or the fooliſh.

How many frantic or hopeleſs beings have made uſe of ſharp-pointed knives againſt themſelves? How many monſters have cruelly uſed them againſt others? The melancholy liſt would, doubtleſs, be long; and, perhaps, if this uſeful inſtrument had not in Italy, Spain, and moſt other countries, the form of a ſtiletto, ſuch crimes would be leſs frequently committed. Experience has long ſince proved that great effects may ſpring from very trivial cauſes.

But howſoever this may be, I muſt not forget that the knives and forks at the Duke of Argyle's table ſerved to help us to very good things. The different courſes, and the aftermeats, were all done as in France, and with the ſame variety and abundance. If the poultry was not ſo juicy as that of Paris, we were amply compenſated by the moſt delicate moorfowl, by delicious fiſh, and

and by vegetables, the quality of which did honour to the ſkill of the Scottiſh gardeners.

At the deſert, the ſcene changed; cloth, napkins, and every thing diſappeared. The mahogany table ſhone in all the luſtre that wood is capable of receiving from art; but it was ſoon covered with brilliant decanters, filled with the moſt exquiſite wines; comfits, in fine porcelain, or cryſtal, vaſes; and fruits of different kinds in beautiful baſkets. Plates and glaſſes were diſtributed; and in every object elegance and conveniency ſeemed to rival each other. I was ſurpriſed, however, to ſee on the ſame table, in ſo cold a climate, and in the middle of the month of September, peaches, apricots, raiſins, prunes, figs, &c. all of an excellent quality, except the figs, which could not be called fine, by a perſon born in the ſouth of France. It is probable, however, that the greater part of theſe fruits were produced by much care and expence in hot-houſes.

Towards the end of the deſert, the ladies withdrew to a room deſtined for the tea-table: I was ſorry that they left us ſo long alone; but the Duke of Argyle informed me, that he preſerved this old cuſtom in his family,

family, in order that the people of the country might not be offended by the breach of a practice, to which they had always been accuſtomed. The ceremony of toaſts was well kept up in the abſence of the ladies; but though they uſually continued to go round for at leaſt three quarters of an hour, no perſon's inclination was violated, and every one drank what he pleaſed. This, however, did not prevent a great number of healths being drank with ſpirit, and every demonſtration of pleaſure. Wines are the greateſt luxury of the Britiſh table. They drink the beſt and the deareſt that grow in France and Portugal. If the lively champaign ſhould make its diuretic influence felt, the caſe is foreſeen, and in the angles of the room the neceſſary convenience is to be found. This is applied to with ſo little ceremony, that the perſon who has occaſion to uſe it, does not even interrupt his diſcourſe during the operation. I ſuppoſe this is one of the reaſons why the Britiſh ladies, who are exceedingly modeſt and reſerved, always leave the company before the toaſts begin.

At laſt they proceeded to the drawing-room,

room, where tea and coffee abound, and where the ladies did the honours of the table with much dignity and grace: the tea is always excellent, but it is not ſo with the coffee: ſince it was not good in a houſe like this, where no expence is ſpared, it cannot be expected to be good any where elſe in the country. I ſhould imagine that the Engliſh and Scotch attach no importance to the fine perfume and flavour of good coffee; for it ſeems to be all one to them what kind they drink, provided they have four or five cupfuls. Their coffee is always weak, bitter, and completely deprived of its aromatic odour. Thus they want an excellent beverage, which would be a thouſand times more favourable to their health than tea. Kæmpfer, who reſided long in Japan, and who has publiſhed ſome very curious obſervations upon tea and the ſhrub that bears it, remarks that it is of a narcotic nature.*

After

* "I obſerved," ſays Kæmpfer "that the tea leaves "contain ſomething narcotic, which occaſions a diſorder "in the animal ſpirits, and makes thoſe who drink them "appear intoxicated: this bad quality is partially cor-

 "rected

After tea, thoſe who chuſed it retired to their apartments; thoſe who preferred converſation and muſic remained in the room; others went out to walk. At ten o'clock ſupper was ready, and thoſe attended it who pleaſed.

In England I always found that all claſſes of people eat a great deal more than the French. I do not know that they are more healthy; indeed, I doubt they are not; but this I know, that Dumoulin, one of the moſt celebrated phyſicians of Paris, once told me, that he was never raiſed in the night to viſit any perſon who had not ſupped.

I have ſaid that I roſe with the ſun to ſtudy the nature of the country, in excurſions among the neighbouring hills. The following is an account of ſome banks of porphyry, which, with reſpect to their poſition, are truly worthy of fixing the attention of naturaliſts.—

" rected by the operation of toaſting the leaves, which is " repeated by degrees; but it is never radically removed: " ſomething capable of affecting the head always remains." *Kæmpfer's Hiſtory of Japan.*

Banks of Porphyry above a Bank of Limestone.

Near ſome lime-kilns, at the extremity of a park, and on the road which leads to Dalmally, there is a quarry in the ſide of an eminence, the working of which has laid the internal organization of the hill completely open. The diſpoſition of its banks, and all the different materials which compoſe it, are perfectly diſcloſed.

A great quantity of ſtones have been taken out of this quarry, for building a mill at a ſhort diſtance, and banking up the ſides of a little river, which, after winding through the park, ſerves to turn the mill. This circumſtance affords the greateſt facility in obſerving the poſition and developement of the materials of the quarry, and renders it an intereſting object for ſtudy and meditation.

The ſuperior part conſiſts of a bed of vegetable earth, which, though not more than five inches deep, produces excellent herbage.

A bank of porphyry, of a reddiſh ground,

and about twelve feet thick, immediately ſucceeds the vegetable earth. This bank ſeparates into three beds, of nearly equal dimenſions, which in ſome places have formed curious rhomboidal contractions, while in others they are ſimply divided into irregular longitudinal cuts.

The maſs of porphyry, twelve feet thick, reſts upon a bed of tender and even earthy ſchiſtus, which is only two feet ten inches thick. The baſis of this ſchiſtus is of a reddiſh-yellow colour. It is ferruginous, mixed with clay, micaceous, and ſoft to the touch. Though in a ſtate of decompoſition, it is, notwithſtanding, magnetic. I only uſe the word ſchiſtus here in relation to the fiſſile diſpoſition of this bed, which, perhaps, is only a detritus of porphyric matter.

This ſchiſtus, in its turn, covers a bank of limeſtone, of about ſeventeen feet thick, at a medium, which may be conſidered as a kind of white marble, and which is ſimilar in its grain and texture to the marble which is called *ſaline*. This whiteneſs is not every where equal; for upon a very white ground there appear ſome parts of a whitiſh grain, covered with parallel lineaments, of a very deep

deep grey, which recal the idea of ribbands.

Of this marble, which is ſuſceptible of a very fine poliſh, may be made chimney-pieces, and jambs of doors and windows. Its grain is ſcaly and ſaline, like the fineſt marble of Italy; but it is hard and rough to the touch. It is not, however, the leſs capable of receiving a lively luſtre. It is entirely free from any foreign body, and were it not ſtained with ſome greyiſh ſtripes it would be one of the moſt beautiful marbles to be met with. It is applied to no other purpoſe than that of making lime.

When I ſaid that this thick bank of marble ſucceeded immediately to the bed of micaceous clayey ſchiſtus, I ſhould have added, that the ſuperior part of the large calcareous bank is interſperſed with ſmall beds, or rather lineaments, of micaceous ſteatites, united with particles of marble. This does not affect its hardneſs, and renders it a kind of cipolin. But this mixture of ſteatites and mica penetrates only about an inch into the marble, which is afterwards perfectly pure. As to the poſition of the

banks, the latter form an obtuſe angle towards the centre of the quarry; the left ſide of the quarry inclining conſiderably from the ſouth to the north, and the right ſide, from the weſt to the eaſt. According to every appearance, this poſition is the effect of ſome great convulſion.

Thus there is inconteſtably porphyry lying above limeſtone, modified into marble. The ground of this porphyry is reddiſh, with a number of cryſtals of felt-ſpar, of a dull white, and ſome cryſtals of black ſchorl, much larger, though leſs compact, than thoſe of the red porphyry of the ancients, but in general very brilliant. The baſis of the ancient porphyry is much harder than that of the porphyry of Inverary, which is ſomewhat earthy: but its baſis is fuſible, like that of the ancient. It is certainly in every reſpect real porphyry.

By theſe circumſtances the quarry of Inverary is rendered very remarkable, and ought to be conſidered as an object well worthy of fixing the attention of all who have it in their power to viſit it.

Time flies quickly away when paſſed in ſuch good company, and ſpent in ſo agreeable

able a manner. It requires a conſiderable effort to leave perſons whoſe natural affability is ſo engaging at firſt ſight, and to whom our attachment increaſes in proportion as we know them better. Alas! what is life but a ſeries of continual privations?—Let us add this to the many others we have experienced; but let us learn to perpetuate our enjoyments by remembrance, and above all by gratitude. Let us leave this delightful manſion; but never let us forget its worthy inhabitants.

CHAPTER XI.

Departure from Inverary.—Arrival at Dalmally.—Scotch Highlanders.——Their Dreſs.——Ancient Tombs.—Patrick Fraſer.—Reception at the Houſe of Mac-Nab, who poſſeſſes ſeveral Fragments of the Poems of Oſſian.—Manner in which the Habitations of the Highlanders are warmed and lighted.—Their Uſages.—The Circle, or Altar, of the Druids.

WE reſumed our journey, at half paſt eight in the morning of the 17th of September, proceeding by the way of Dalmally. We ſoon experienced a ſtriking contraſt; for ſcarcely had we loſt ſight of the moſt charming of manſions, and the moſt amiable of hoſts, when we entered into the midſt of a chain of mountains of the wildeſt aſpect.

The road is narrow, jagged with blocks of porphyry, and bordered in many places with banks of black ſchiſtus, cut perpendicularly,

dicularly. The gloomy appearance of this ſtone, interſected with large veins of white calcareous ſpar, ſeems to announce to paſſengers the mourning of nature in this frightful ſolitude.

This dreary and rugged way, where during eight hours we met with neither living creature, habitation, tree, nor verdure, is alike fatiguing to the body and the imagination. Our horſes themſelves, though freſh and well reſted, appeared to be tired of it.

Often had I aſked our guides whether this diſagreeable road was near its end, when at laſt, about four in the evening, one of them ſhewed me a ſmall column of ſmoke at a diſtance, telling me that was the place where we ſhould ſleep, and that we ſhould reach it in half an hour. In a quarter of an hour after, indeed, we found ourſelves releaſed from the kind of cloſe priſon, in which we had been confined from eight in the morning.

A fine valley*, ſtudded with cottages, ſuddenly opened to our view. A ſmall river,

* Glenurchy. *Tranſlator.*

called

called *Urchy*, winding along on the left, ſeveral houſes in groups, and others ſcattered around, a church in the bottom, and a diſtant proſpect of a lake, formed the embelliſhments of this landſcape. The place where we ſtopped is called *Dalmally*.

The inn is conſpicuouſly ſituated on a ſolitary eminence, covered with verdure. On our arrival, we ſaw about fifteen highlanders oppoſite to the entrance. All of them wore the ſame remarkable garb; and they ſaluted us in a very kind manner, accompanied, however, with an air of ſtatelineſs. We underſtood by their geſtures that we were the ſubject of their diſcourſe; for they ſpoke only in the Celtic language. But our hoſt, who received us very handſomely, and who could ſpeak a little Engliſh, ſaid that we might make ourſelves eaſy with reſpect to theſe men, who, being but little accuſtomed to ſee ſtrangers in ſo retired a ſituation, where few paſſed, were fixing their attention upon us with pleaſure.

"You may aſſure yourſelves," ſaid he, "that theſe good highlanders, far from "doing you any injury, would, on the con-

"trary,

" trary, think themſelves happy to be able " to treat you according to the laws of hoſ- " pitality, which they have loved and re- " ſpected from the remoteſt period: this " is Sunday, which occaſions ſo many to " meet together."

We learned, in fact, that the Scotch highlanders are in general very zealous preſbyterians, and ſuch rigid obſervers of religious worſhip, as not to indulge themſelves on that day in the moſt trifling amuſement. They had juſt come from hearing ſermon, and were reſting themſelves a little before retiring to their reſpective homes. Their grave and collected air formed a ſingular contraſt with the gaiety and ſhowy colours of their military garb.

Their dreſs is very remarkable. It conſiſts in a military jacket, with ſleeves and facings of a woollen ſtuff, in which the colours croſs each other, ſo as to form large ſquares of red, green, blue, and white; in a mantle of the ſame ſtuff, tucked up and pinned on the left ſhoulder, called the plaid; and in a kind of petticoat, ſhort and plaited like the lower part of the military dreſs of the Romans. This laſt ſerves them inſtead of breeches;

breeches; but it does not deſcend much lower than the middle of the thigh. Their legs alſo are partly naked, being covered only with woolen half-ſtockings, of vivid colours, ſo diſpoſed in croſs-bars as to imitate very nearly the ancient buſkin. Their head is covered with a blue bonnet, ſurrounded with a narrow variegated border, of red, blue, and green, and decorated with one long and waving plume. They generally carry a poniard, and frequently a pair of piſtols, in their girdle; this poniard bears the name of *durk* or *dirk*. Their ſhoes, which, in general, each makes for himſelf, in a coarſe but ſtout manner, are tied with ſtrings of leather; this kind of ſhoes are known by the name of *brogues*.

They keep their money in a waiſt-belt of otter ſkin, which ſerves at the ſame time as an ornament. It is ſo formed that the ſkin of the animal's head hangs down before. The eyes are edged round with red woollen tape, and the whole is furniſhed with a number of ſmall taſſels of different colours. This ſkin covers a pouch, which ſerves them by way of purſe.

Such is the attire which the Scotch highlanders,

landers, as well as the inhabitants of the Hebrides, have worn from a very remote antiquity.* Did they copy them from the Romans at the time when thoſe lords of the world attempted in vain to conquer them; or have they received them by a more ancient derivation from their anceſtors, the Celtic? This is a queſtion of difficult ſolution.

It is, however, well known that the modern deſcendants of the ancient Caledonians are ſo attached to this form of veſture, which reminds them of their ancient valour and independence, that the Engliſh government found its repeated attempts to induce them to lay it aſide, completely fruſtrated: though this dreſs is certainly the leaſt adapted to a people who inhabit ſo cold and humid a climate.

After taking leave of our pious highlanders, we viſited the place where we were

* According to Diodorus Siculus, the ancient Celtiberians alſo wore party-coloured garments. "*Veſtibus* "*utuntur mirificis, tunicas nempe tinctas, et variis colo-* "*ribus floridas, quaſi illi geſtant Diodor.*" Sic. L. V. *Bibliot.* It ſhould be remarked, that the Scotch highlanders and Hebridians ſtill ſpeak the Celtic, or Celtiberian language.

to

to lodge; and its elegant appearance in ſo wild and unfrequented a ſituation aſtoniſhed us. The threſhold of the door, and the ſtairs, were ſcoured and ſtrewed with fine ſhining ſand; the dining-room was covered with a carpet; the beds were neat and good; and the landlord was a worthy man.

We informed him of the object of our journey; and as we were now only one day's travel from the place of embarkation, we aſked him whether it was poſſible to procure us a guide well acquainted with the language of the country, and capable alſo of ſpeaking a little Engliſh. "Gentlemen," ſaid our hoſt, with an air of eagerneſs, "I ſhall be able to accompliſh "your wiſhes, and to procure you a perſon verſed in different languages, who will "act both as an interpreter and guide; "having already viſited ſeveral of the iſles "which you intend going to ſee. He is "one of my beſt friends; and nothing more "is requiſite to be known, than whether "the employment in which he is engaged "will admit of his being abſent.—I am going this inſtant to enquire."

As he pronounced theſe words, he left

us

us with an agility and vivacity, which aſtoniſhed me, in a man of his age. I never met with a perſon of a more obliging and cheerful diſpoſition, than this good Scotſman.

He came back a few minutes after, accompanied by a man of about twenty-eight years of age, of a mild and modeſt appearance, whom he preſented to us under the name of Patrick Fraſer, ſchool-maſter of Dalmally. We ſoon formed our acquaintance with him. This man had proſecuted his ſtudies with advantage, at the univerſity of Edinburgh; he was well inſtructed in Greek and Latin, ſpoke Engliſh, and was completely maſter of his native language, the Celtic, which he regarded as one of the richeſt and moſt harmonious.

Patrick Fraſer was paſſionately fond of the verſes of Oſſian; and often made excurſions among the inhabitants of the mountains in queſt of further fragments of thoſe ancient poems. He had already procured as many as would form a conſiderable addition to the collection of M'Pherſon, and continued to make frequent and happy diſcoveries

coveries in that reſpect, from the extreme pains which he took for that purpoſe.

The narrowneſs of his fortune neceſſitated him to exerciſe the humble occupation of a ſchool-maſter.

The children of the place aſſembled in a kind of hut, conſtructed of ſtones, without any cement. Here the poor Patrick Fraſer taught them to ſpell the Celtic, or Erſe words, printed in the common character; for it would appear that the original characters of that language are loſt.* I felt for

* Knox ſeems to have a different opinion; and as what he ſays on the ſubject is well worthy of attention, I extract the following paſſage from his book: "To theſe "obſervations I ſhall add a few facts, to prove that we "had for a long time back a written language. In the "iſland of Mull, in the neighbourhood of Jona, there has "been from time immemorial, till very lately, a ſucceſ-"ſion of *Ollas*, or *Graduate Doctors*, in a family of the "name of Maclean, whoſe writings, to the amount of a "large cheſt full, were all wrote in Galic. What re-"mained of this treaſure, was not many years ago bought "up as a literary curioſity, at the deſire of the Duke of "Chandois, and is ſaid to have periſhed in the wreck of "that nobleman's fortune.

"Lord Kaimes (Sketches, b. i.) mentions a Galic "manuſcript of the firſt four books of Fingal, which the "tranſlator of Oſſian found in the iſle of Skye, of as old a "date as the year 1403. Juſt now I have in my poſſeſ-"ſion

for the condition of this eſtimable and modeſt man; but as I expreſſed my ſurprize and aſtoniſhment at ſeeing him reduced to follow ſuch a vocation for ſubſiſtence—"I "conſole myſelf," ſaid he, mildly, "with "my ſtudies, and the deſire of extending "my information. It is true, that I ſometimes feel uneaſy, when I reflect that "here I am deſtitute of every ſource of "inſtruction. I ſhould doubtleſs prefer "living, though only on a little bread and "water, in a city where I could find the "means of gratifying my taſte;—but I muſt "learn to accommodate myſelf to circumſtances."

"ſion a mutilated Treatiſe of Phyſic, and another of Ana-
"tomy, with part of a calendar, belonging probably to ſome
"ancient monaſtery, all in this language and character.
"Theſe pieces, when compared with others of a later
"date, appear to be ſeveral centuries old. I had the uſe
"of another equally ancient, from Capt. M'Lauchlan, of
"the 55th regiment. It conſiſted of ſome poems, and
"a theological diſcourſe. From theſe obſervations and
"facts, it clearly appears, that ever ſince the time of the
"Druids, the Galic has been always a written language."
Knox's *Tour through the Highlands of Scotland*, &c.

It is to be regretted that Knox has not ſaid ſomething reſpecting the form of the characters which they uſed, and ſhewed what relation they bore to thoſe of the Hebrew, Arabic, Greek, or Runic alphabets.

I ſhould never have expected to meet with a philoſopher of this nature, in ſuch a place. A thouſand times did I regret that it was not in my power to charge myſelf with the future fortunes of that ſingular and intereſting man.

I ſtated to him our wiſh to receive information from him reſpecting the manners and uſages of a country ſo familiar to him; and I aſked whether he could do us the pleaſure of accompanying us to the iſles of Mull and Staffa.

"Moſt willingly," ſaid he, "but I ought "firſt to obtain the conſent of the pa- "rents of the children whom I inſtruct. It "would be improper for me to requeſt a "longer ſpace of abſence than a week; to "which, if they conſent, I am at your com- "mand."

We begged that he would do us the favour to ſup with us; and as it was yet early in the evening, we requeſted he would go and ſpeak with the principal inhabitants of the place, on the ſubject of the requiſite permiſſion. He took leave of us, and went to accompliſh this object.

I profited

I profited by the remainder of the day, to make an excurſion for the purpoſes of natural hiſtory, in the environs of Dalmally. I found that the ſtones which enter into the compoſition of the mountains here, are, in general, argillaceous ſchiſtus, intermixed with mica, of a greyiſh, or blackiſh colour, of a texture ſomewhat fibrous, and ſeparating in leaves, more or leſs thick. The elements of this ſtone are pulverulent felt-ſpar, quartzoſe earth, clay, mica, and a ſmall portion of iron.

I likewiſe examined the ſtones rolled down by the torrent of Urchy. They conſiſt of blocks of granite, ſpathoſe rocky ſchorl of a black colour, and of compact lavas, of the nature of baſaltes. All theſe ſtones are round, their angles being ground down with rolling along in the torrent, which carries them from a conſiderable diſtance.

I was drawn by a large ſmoke towards the declivity of a hill, where I preſumed that ſome perſons were burning lime. But as I had not yet perceived any calcareous ſubſtance here, and did not chooſe to deceive myſelf, to ſettle the matter I walked

to the place whence the ſmoke proceeded, though it was ſome way off.

I there found a lime-kiln at the foot of a quarry, worked perpendicularly out of the ſide of the hill. I attentively obſerved the order and diſpoſition of the matters; of which the following is an account:

1ſt, The vicinity of the quarry, and, in general, all the ſurrounding hills are compoſed of micaceous fibrous ſchiſtus, which do not effervesce with acids.

2dly, The quarry is covered with a layer of quartzoſe ſand, of a yellowiſh colour, three inches in thickneſs.

3dly, The ſand is ſucceeded, particularly towards the left part of the quarry, as one views it in front, by very ſmall ſtrata of micaceous ſchiſtus, of the ſame nature with that of the neighbouring hills.

4thly, To theſe ſmall beds of micaceous ſchiſtus adjoin two banks of calcareous ſtone, or more properly of calcareous ſpar, white, compact, hard, grained like ſalt, and intermixed with ſmall laminæ of ſilvery mica, which ſtick in the calcareous body. Each of theſe calcareous banks is about four feet in thickneſs.

Thus,

Thus, in a ſpace of fifteen miles, have I met with two inſtances, pretty much alike, of calcareous beds exiſting between rocks of a different nature: that of Inverary, where the calcareous ſtrata, intermixed with mica, lie between banks of porphyry; and this, where the calcareous ſtone is covered with micaceous ſchiſtus.

But it is important to obſerve, that in both quarries the calcareous matter is in the ſtate of ſpar; that is to ſay, it has undergone a confuſed cryſtallization, during which tumultuous and rapid operation, it has ſeized ſome particles, or rather ſmall laminæ of mica. No veſtige of marine bodies is ever found in theſe circumſtances, as the calcareous matter is then in a ſparry ſtate, that is, held in a ſtate of ſolution; the firſt mode of its exiſtence being effaced by the agitation and ſuſpenſion of the particles in a fluid, which has occaſioned a confuſed cryſtallization.

I do not, however, think that the opinion would be well founded, that this calcareous ſtone, which diſcovers no trace of any organic ſubſtance, is the product of an original earth, formed by nature, without

the concurrence of ſhells, madrepores, or other marine bodies. For how can we be certain that the calcareous ſtrata here mentioned, have not been produced at a more early period by the animals of the ancient ocean, of whom the matter then bore diſtinctive traces, which have been ſubſequently effaced by ſolution, change of place, and ſecondary cryſtallization.

We ſee every day inſtances of new aggregations, deſtructive of the primitive forms. The grottos of Antiparos, of Our Lady of Balma, and ſeveral others, exiſt in the midſt of calcareous rocks of ſhells.

The droppings which daily fall from the roof of ſubterraneous caverns, produce conſiderable maſſes of ſtalactites towards the top of the vaults, and of ſtalagmites on the ſides, or towards the bottom. Would one be authoriſed, on examining ſome tables of theſe ſtalagmites, or calcarious alabaſters, ſuſceptible of ſo fine a poliſh, and of a ſemi-tranſparency, ſo agreeable to the eye, to pronounce that, as they exhibit no veſtige of an organic body, theſe ſecondary ſtones are the products of a primitive calcareous matter, that is, of a matter which came

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out of the hands of nature in its preſent form? As if it were allowable in good logic to break the thread of analogies; as if a ſeries of analogical facts did not at leaſt amount to probabilities; as if the expreſſions, primitive mountains, original calcareous matter, were any thing elſe than unintelligible abſtractions, when we obſerve viſible and palpable agents which produce, and even aſſimilate themſelves to the calcareous matter in organic forms. Theſe forms are ſo many diſtinguiſhing marks, and intereſting indications, proper to direct us in the painful and difficult path of the hiſtory of the revolutions of the earth.—Upon all occaſions then, when we ſee them, effaced, in circumſtances where the matter, loſing its organic form, is modified into ſpar, alabaſter, ſtalactites, ſaline marble, or gypſum; I do not conceive that we are juſtified in pronouncing deciſively that it has not been produced by organic bodies, or that it has never paſſed through animal filters. It is the ſame with the mountains denominated primitive; with thoſe of granite, for example, which are formed by the aggregation of ſeveral ſubſtances of dif-

ferent origin, that neceſſarily ſuppoſe an exiſtence anterior to that of their aggregation, in the forms of felt-ſpar, mica, ſchorl, quartzoſe, calcareous, and ſometimes ferruginous particles. But I ſhall proceed no farther, as this is not a place to enter into the diſcuſſion of theſe great and important queſtions.

As the day was now drawing to a cloſe, I was obliged to ſuſpend my reſearches, and to rejoin my companions at the inn. There I found Patrick Fraſer, who told me that he was at our ſervice, and that he had permiſſion to remain ten days with us. This information gave us very great pleaſure.

We ſat down to table. Our ſupper conſiſted of two diſhes of fine game, the one heathcock, the other woodcock, cream, freſh butter, highland cheeſe, a pot of preſerved *vaccinium* (bilberries), a wild fruit which grows on the mountains, and port wine. They were all ſerved up together, and formed a truly luxurious repaſt for the country.

Our hoſt, who was naturally polite, and who beſides took us for ſome great perſonages, on ſeeing us arrive with three carriages

riages and four domeſtics, inſiſted, notwithſtanding our objections, on paying us all the honours which he was accuſtomed to ſhew the Scotch *lairds*. He accordingly took his ſtation behind one of us, in order to receive and execute our orders. Wiſhing to place him on a more friendly footing, we begged that he would take a ſeat at table with us. This, however, he refuſed; nor would he conſent to accept of any thing but a ſingle glaſs of wine to drink our health. After ſupper he brought us ſome excellent rum and tea, of which we had much need, to refreſh our ſpirits. Of theſe he conſented to partake with us, and we ſpent the remainder of the evening in an agreeable converſation with that good-hearted man, who gave us ſome intereſting communications reſpecting the manners and uſages of the country.

This innkeeper was in eaſy circumſtances, and his children, who were very numerous, were educated with great care. Patrick Fraſer ſerved as their tutor, and a writing, and alſo a dancing maſter came every year from a diſtance to ſpend ſome months at his

his houſe, excluſively occupied in giving them leſſons.*

At ſunriſe of the next day, I went to viſit the church, which had attracted my attention, the preceding evening, by the number of tombſtones which I ſaw in an adjoining field.

This country church is a modern fabric; and its ruinous condition, both without and within, ſtrongly proclaims the poverty of the inhabitants of the place.

But a vaſt number of tombs, and ſome levelled ruins at a little diſtance from the church, indicate that there formerly ſtood on that ſpot ſome very ancient religious monuments, which have been deſtroyed probably at a remote period: for if fanaticiſm had diſplayed itſelf here, in its uſual manner, at the epoch of the reformation, we ſhould have found more conſiderable remains of buildings, nor would ſo many tombs

* "A commodious inn at this place," ſays Knox, "is "rented at 6*l.* and the window tax amounts to 4*l.* 10*s.* "This diſproportion ariſes from the well-judged munifi- "cence of the proprietor, who thus almoſt at his own ex- "pence, accommodates travellers with decent lodgings."

have

have been reſpected at a time when nothing was reſpected.

The ſtyle of the workmanſhip of the moſt ancient of theſe tombs was ſo remarkable, and uncommon, that I reſolved, for my own inſtruction, to examine them very carefully.

All of them are conſtructed of *lapis ollaris*, or coarſe ſerpentine ſtone, of a deep grey colour, nearly reſembling that of which the Caſtle of Inverary is built. This ſtone has completely reſiſted the impreſſions of the weather, and the tombs, which appear the moſt ancient, are in a moſt excellent ſtate of preſervation.

Their form is that of a ſimple ſepulchral ſtone, ſomewhat narrower towards the bottom than the top, in the manner of a coffin. But I know not whether they have always been in their preſent ſtate, or whether they have not formerly ſerved as covers to hollow tombs, ſuch as thoſe of the Romans generally were.

Several are cut into right angled parallelograms. Some are five feet eight inches, while others, which are the moſt numerous, are only five feet three inches in length. I found

found one which meaſured only three feet and a half in length, and eight inches in breadth; it was probably the monument of an infant. The reſt are, in general, fifteen inches broad. All theſe monuments are placed flat on the ground, in various directions.

Among theſe ſepulchral ſtones I counted eighteen, ſcattered here and there, which ſeemed to be the moſt ancient, from their workmanſhip: for they have neither inſcription nor date. But they exhibit a peculiar character; being loaded with ſculpture in demi-relievo, repreſenting warriors armed with lances, bucklers, poniards, and arrows, and having their heads covered with bonnets in the form of mitres.

On others are ſeen figures of common horſes, among quadrupeds, of an odd and fantaſtical ſhape, placed by the ſide of each other, like the figures on hieroglyphical tables; and in the midſt of all theſe appear combatants. Theſe baſſo-relievos are generally incloſed with a border, which is itſelf of a peculiar character. It conſiſts of arabeſks, ſurcharged with knots and ornaments,

reſembling

reſembling filagree work, which croſs each other in ſo many different directions, that it is impoſſible to form a clear idea of what the ſculptors intended to repreſent.

It is, perhaps, ſuperfluous to obſerve, that the figures of men and animals are executed without any regard to meaſure, proportion, ground, or perſpective, they are expreſſed, however, with a kind of neatneſs. The character, the phyſiognomy, if I may uſe the term, of theſe monuments, have no relation to the Gothic ſtyle; and, but for the border which ſomewhat reſembles the Turkiſh ornaments, there is nothing to which I could ſo juſtly compare them as the hieroglyphical figures.

It would be difficult, therefore, to aſſign the epoch when theſe monuments were erected; the ſtyle of their workmanſhip being ſo ſingular, that a compariſon of it with any thing we already know, could be of little advantage to regulate our inquiry.

Some of the natives entertain an opinion, founded on tradition, that they are the ſepulchres of the celebrated warriors who lived in the times of the ancient kings of Scotland. But the hiſtory of thoſe kings,

is

is itſelf loaded with obſcurity and fable. Others ſuppoſe that they contain the remains of the heroes of the north, who flouriſhed at the epoch when the Danes made frequent incurſions on the coaſts of Scotland, of which they gained poſſeſſion at different times.

But does it not appear very extraordinary that the one or the other ſhould have ſelected for their place of interment a wild country, encompaſſed with mountains, ſcarcely inhabited, at the diſtance of a days' journey from the ſea, and without any road leading to it? What motive could have determined this preference?

Would it not be more plauſible to ſuppoſe, that this burying-place had been formed in conſequence of ſome great battle near it? But the number of theſe tomb-ſtones, and the long and difficult labour requiſite to carve them, muſt neceſſarily imply a degree of time and leiſure, which prove them to be the work of a ſettled people, to whom the arts, however ſmall their progreſs among them, muſt yet have been no ſtrangers.

They are certainly deſerving of the attention of the learned ſociety eſtabliſhed a few years ago, at Edinburgh, for inquiring into the

the ancient monuments of Scotland, and of another lately formed for the ſame purpoſe at Perth. I invite them, by their love of the ſciences and their country, to direct their reſearches to this ſubject*.

In the mean time, thoſe who are curious to form an opinion of the ſtyle of this kind of monuments, may ſee a repreſentation of one, found in a different part of Scotland, in a work of Mr. Gardiner, miniſter of the

* If the facts ſtated by Knox reſpecting the antiquities of the Iſle of *Iona*, or *Icolumkill*, one of the Hebrides, are correct, as there is reaſon to ſuppoſe they are, the ancient monuments abovementioned might indeed have been tranſported thence. But it is ſtill difficult to believe that they ſhould have been carried ſo very far inland. "This "place [Icolumkill]," ſays Knox, "became alſo the "ſepulture of forty-eight kings of Scotland, eight of Nor- "way, four of Ireland, beſides the chiefs of the Highland "and Hebridian clans, ſome of whoſe effigies ſtill remain "on the ſpot, many have been deſtroyed, and others have "been purloined for *other church-yards in the Highlands.*

"I have ſeen ſome of theſe effigies, and alſo ſome of the "ſtone croſſes, that have been taken from Icolumkill. "One of the latter ſtands in the centre of the town of "Campbeltown; a beautiful pillar, ornamented with "foliage. The effigies have been carried moſtly to Argyle- "ſhire, where they are laid over the graves of the princi- "pal inhabitants. A number of them may be ſeen at "Kilmartin, where the people can give the names of the "perſons on whoſe graves they were originally placed." Knox's *Tour*, &c.

goſpel

goſpel at Bamf, entitled, " Antiquities and Views of the North of Scotland; London, 1780," in ſmall 4to. page 64. This book is written in Engliſh, and embelliſhed with very fine engravings.

Before I diſmiſs the tombs of Dalmally, which have, perhaps, detained me too long already, it is with pleaſure that I advert to a circumſtance that exhibits to thoſe who are attached to the arts, and make them their particular ſtudy, a kind of uninterrupted filiation which is very remarkable, though what I am about to mention ſuppoſes the art to exiſt in its infancy only. It will, however, ſhew how much example naturally inclines men to imitation.

The inhabitants of Dalmally having had theſe ancient monuments in their view from generation to generation, have not only preſerved the ſame ground as a place of interment for their dead, but have likewiſe attempted to decorate the ſtones which cover them with ſculpture; not, indeed, in baſſo-relievo, which might have been too difficult, but in a ſcooped ſtyle.

The mode of ornament preſented by the ancient tombs appearing to them too complicated

plicated and unintelligible, they adopted, with a juſt preference for their own, figures connected with their religion, or emblematical of their profeſſions; and as the lapis ollaris, which they make uſe of, is not very hard, their labours have never been diſcouraged by any difficulty of execution.

We, accordingly, ſaw one of theſe ſtones, which had a more modern look than the others, and could not, at fartheſt, have lain there above five hundred years, with the repreſentation of a crucifix occupying its whole length, but without any ornament or figure of Chriſt. This crucifix is cut into the ſtone, and is executed with the greateſt preciſion. There are others gradually leſs ancient, on which are ſculptured hammers, ſtone chiſſels, anvils, fiſhing-boats, nets, and all the various implements connected with the vocation of the perſons deceaſed. The moſt modern tombs are decorated with hour-glaſſes, death heads, and armorial bearings.

This ſucceſſive imitation, ſupported by religious uſage, muſt neceſſarily be very limited, and cannot have made great progreſs in ſo wild a country. It is ſingular, however, that men ſo poor, ſo deſtitute of inſtruction,

and ſo remote from communication, ſhould have had, during ſo many ages, and ſhould ſtill continue to have, ſculptors of ſome ſort; whilſt, in towns of the third rate, it would be difficult to find a man capable of tracing a ſimple eſcutcheon, or cypher, on ſuch monuments.

Patrick Fraſer came to call me away from my tombs and my reveries, and to announce that we had to viſit a very intereſting perſon, who was the poſſeſſor of monuments of a different kind.

"We ſhall have a quarter of an hour's "walk only to his houſe," ſaid Patrick Fraſer. "The name of this man is Mac-"Nab. He has in his poſſeſſion a precious "manuſcript, containing ſeveral of the "poems of Oſſian in the Celtic language. "You ſhall have the pleaſure," added he, "of hearing him ſing them; for the carol-"ing of the ſublime verſes of this ancient "poet has always been a ſort of amuſe-"ment, which the inhabitants of the moun-"tains and of the Hebrides have preſerved "and tranſmitted from generation to gene-"ration."

Mac-Nab's houſe is ſituated on the top of the ſame hill on which the inn ſtands. We proceeded

proceeded to the place. " I ſhould inform " you beforehand," ſaid Patrick Fraſer, " that the kind of bard whom we are going " to ſee, is at once a lock-ſmith, black- " ſmith, armourer, and ironmonger, which " renders him very uſeful, and very much " eſteemed. He is, beſides, endowed with " ſound ſenſe, and a ſtriking native wit, " which will afford you much pleaſure."

His houſe ſtands in the midſt of a group of habitations, which form a ſmall hamlet. We entered his workſhop, which is neither large nor magnificent. His brother did us the honours of the place, and received us with the moſt agreeable demonſtrations of politeneſs and friendſhip. He told us, that his eldeſt brother had gone from home two days before, and that he would be very ſorry for having loſt the opportunity of receiving ſtrangers who had come ſo far to pay him a viſit. " I cannot," ſaid he, " do myſelf the plea- " ſure of ſhewing you the treaſure, of which " our family has been in poſſeſſion for more " than four hundred years, becauſe my brother " keeps it under lock and key. But if you " could remain here during the reſt of the " week only, he would be at your command,

" having deſigned to be home in three days " hence. He will recite the verſes of " Oſſian, and tell you ſome very curious " things reſpecting that great poet. As to " myſelf, I can have the pleaſure only of " ſhewing you the buckler of my great " great grandfather."

He accordingly brought us, a moment after, a large buckler, of a round form, made of wood, overlaid with copper, and decorated in the centre with the repreſentation of a roſe, likewiſe of copper. This buckler, known in the language of the country by the name of *target*, was of a ſolid and neat conſtruction, but ſomewhat decayed with age. This good man, whoſe expreſſions were literally interpreted to us by Patrick Fraſer, then brought us, with the moſt obliging readineſs, ſeveral pieces of iron armour, which had been found a few years before in the ruins of an old caſtle in the neighbourhood. They were nowiſe different from the armour of the fourteenth century.

On caſting my eyes round Mac-Nab's workſhop, where his brother received us, my attention was attracted by a poniard, of an

an elegant form. Its handle was made of wood only, but of a very hard kind. It was ſculptured in a ſtyle of the moſt exquiſite taſte, and of the moſt perfect and finiſhed workmanſhip. The ſculpture conſiſted of vermiculated knots, formed in cluſters, and paſſing and repaſſing each other in the moſt graceful manner, and without the ſmalleſt confuſion.

It is not improbable that the firſt model of this poniard, and alſo of the dreſs of the Highlanders and Hebridians, was taken from the Romans, with whom they were long at war. For the *plaid*, the ſhort jacket, the durk, the *target*—that is, the mantle, coat of armour, and buckler—were part of the accoutrement of a Roman ſoldier. I muſt repeat, that ſome very powerful motives muſt have attached them for ages to that mode of dreſs, which is inconteſtibly the worſt adapted to a climate ſo wet, and where the winter is ſo long.

I aſked Mac-Nab's brother whether he would ſell me the poniard, for which I ſaid I would give him a handſome gratuity. "It "is not ours," replied he; "it belongs to "one of our friends in the mountains, who

" has received it from his anceſtors, and " who would not part with it for any price. " He has left it for repair with my brother, " who is able to make you one in every re- " ſpect ſimilar, if you wiſh it." Upon that, he pulled out a drawer, in which there lay ſeveral in an unfiniſhed ſtate. " We never " deviate," ſaid he, " from this form, " which is a very good one, being agreeable " to the eye, and affording, at the ſame time, " a ſolid hold to the hand which uſes it. " All the weapons of this kind which are " made here, or in the neighbouring moun- " tains, are of the ſame form with theſe, " and that from time immemorial*."

* M. F. Hill, who travelled in the mountains of Scotland with the intention of ſeeing the country, and at the ſame time of making critical reſearches reſpecting M'Pherſon's tranſlation of Oſſian, publiſhed a pamphlet, of which he kindly gave me a copy, when on his travels in France. This publication, which contains only thirty-ſix pages of printing, is entitled, *Ancient Erſe Poems, collected by M. Hill, among the Scottiſh Highlands, in order to illuſtrate the Oſſian of M'Pherſon.* This traveller, in going paſt Dalmally, did not omit calling upon Mac-Nab, who boaſted to him that all his anceſtors, for four hundred years back, had been blackſmiths. Mr. Hill ſays that he was far from wanting ſenſe and information; and that he is placed, by Mr. Smith, among the authorities for his collection of Erſe poems.

Mac-

Mac-Nab, after receiving us ſo politely in his brother's houſe, requeſted, with great importunity, that we would accompany him to his own, where we were expected; aſſuring us, at the ſame time, that ſuch a favour would do him a great deal of honour among the inhabitants of the place. We yielded, with pleaſure, to his invitation.

The cottage, or rather hut, which he inhabited, was buried ſeveral feet in the earth, as a ſecurity againſt the moſt intenſe cold; but being placed on an elevated ſituation, it was, notwithſtanding, entirely ſafe from humidity.

It was ſupplied with every thing requiſite to form a comfortable dwelling in ſuch a place. It was divided into two apartments, beſides a cloſet on the ground-floor; for the inhabitants of this region never think of building their houſes with ſtories; with them rural architecture is ſtill in its primitive ſtate.

The apartment to the right of the entrance contained ſome ſacks of barley, and a quantity of oatmeal. Theſe are the only kinds of grain which arrive at maturity in this country; and though they are ſeldom

reaped till about the middle of October, it is further neceſſary to dry them on kilns. We ſaw there, alſo, ſome bottles of whiſkey, a kind of aqua vitæ, diſtilled from barley. It is of a bad quality, and an empyreumatic taſte; but it conſtitutes their beſt liquor, and is their favourite luxury. We were alſo ſhowed a very neat preſs, in which there was ſome linen, and ſeveral elegant *Roman* dreſſes, appropriated for their holidays. The ſame room, though it was not very large, and alſo the cloſet, contained ſome ſimple and plain dairy utenſils, and a quantity of peats, very artfully built up againſt one of the walls. The ſmalleſt corners of this little place were applied to uſe, and every thing was in its proper poſition. We ſoon ſaw that the brother of Mac-Nab was a lover of order.

The ſecond apartment ſeemed to be uſed as the chamber of preſence. Here his relations were aſſembled, and waited to receive us with due ceremony.

A peat fire, which was kindled on a large round ſtone, raiſed ten inches above the floor, and placed in the middle of it, ſerved to warm the room. The ſmoke paſſed vertically

tically through an aperture in the top of the roof. A ruſtic wainſcotting, conſtructed in the form of an inverted mill-hopper, begins at this aperture, and gradually enlarging itſelf, deſcends to within four feet of the ground, at the diſtance of three feet from the walls. It is, therefore, neceſſary to ſtoop on entering this room, or rather chimney; for it may be truly ſaid, that the place where the family received us, was in the chimney itſelf. This conſtruction is well adapted to preſerve them both from ſmoke and cold; and one feels very warm in that kind of wooden box, which retains the heat well. Two ſmall openings had been made in the chimney to admit the light. Wooden benches were ranged all round the interior part, that is, the chimney. Mac-Nab's relations, who were gravely ſeated on theſe benches, roſe up as we entered, bowed towards us, and made ſigns for us to be ſeated alſo; they appeared nowiſe embarraſſed. Patrick Fraſer acted as our interpreter, and preſented our compliments.

We were no ſooner ſeated, than a young man ſhut the window; and a ſecond lighted a lamp, of a peculiar form, which yielded a great

a great flame, accompanied with a reſinous ſmoke. This houſehold lamp conſiſted in a kind of iron ſhovel, bent towards the bottom, and ſuſpended by a long handle in a corner of the chimney, within reach of the ſpectators. On this were lighted pieces of reſinous wood, chiefly cut from the *pinus tæda*, and well dried, which gave a very bright flame, intermixed, however, with a great deal of ſmoke. The perſon appointed to ſupply the lamp, has beſide him a ſtock of this wood cut into ſmall bits, with which he conſtantly replaces what is conſumed*.

It was by the light of this extraordinary luminary, that Mac-Nab, taking by the hand a young, agreeable and modeſt girl, whom I preſumed to be his daughter, uſhered her into our preſence. She brought in a very neat and clean wooden bowl, filled with milk, which ſhe offered to one of us, courteſying at the ſame time with a little timidity and embarraſſment. But, on being encouraged by her father, ſhe drank firſt

* Though this wood is now ſo extremely ſcarce in the country, that there can hardly be ſeen a tree of the kind, a number of old ſtumps of it are ſtill found at the depth of ſeveral feet in the peat moſſes.

herſelf,

herſelf, and paſſed it to the perſon to whom ſhe had before preſented it. It then paſſed from hand to hand, or rather from mouth to mouth, until every one had taſted it, when it returned to Mac-Nab, who cloſed the ceremony with much ſolemnity. It ſhould be obſerved, that we were all ſtanding at this moment. There is a ſort of religious ſolemnity in this hoſpitable uſage, ariſing from the deſire of giving a kind reception to ſtrangers: it is regarded among them as a ſacred duty.

We were then preſented with butter, cakes made of oatmeal, and a glaſs of whiſkey. We returned our beſt thanks to this good family, who poſitively inſiſted on accompanying us back to the inn*. Patrick Fraſer

* The celebrated Johnſon viſited, in Inverneſsſhire, a leſs commodious habitation. His account of it deſerves to be copied here.

"Near the way, by the waterſide, we eſpied a cottage. "This was the firſt Highland hut that I had ſeen; and as "our buſineſs was with life and manners, we were willing "to viſit it. To enter a habitation without leave, ſeems "not to be conſidered here as rudeneſs or intruſion. The "old laws of hoſpitality ſtill give this licence to a ſtranger.

"When we entered, we found an old woman boiling "goat's-fleſh in a kettle. She ſpoke little Engliſh, but we "had interpreters at hand; and ſhe was willing enough to diſ-

"play

Fraſer aſſured us that it would be conſidered as an inſult by theſe obliging people to offer them the moſt trifling gratuity. This ſcene appeared to me ſo intereſting, that I made our draughtſman take a ſketch of it while we were in the houſe.

On leaving his houſe, Mac-Nab ſhewed us, on a ſmall hill, at a little diſtance from it, a ſimple, but ancient, monument, for which the people of the country entertain a ſort of veneration; being informed, by tradition, that this kind of monuments, which bear in their language the name of *cairn*, ſignifying a druidical circle, were in former times conſecrated to the religious ceremonies of the Druids. This one conſiſted of a ſmall circular incloſure, formed by large rough blocks of granite.

" play her whole ſyſtem of economy. She has five children, " of which none are yet gone from her. The eldeſt, a boy " of thirteen, and her huſband, who is eighty years old, " were at work in the wood. Her two next ſons were " gone to Inverneſs to buy *meal*, by which oatmeal is " always meant. Meal ſhe conſidered as expenſive food, " and told us, that in ſpring, when the goats gave milk, the " children could live without it.

" With the true paſtoral hoſpitality, ſhe aſked us to ſit " down and drink whiſkey. She is religious, and though " the kirk is four miles off, probably eight Engliſh miles, " ſhe goes thither every Sunday."

After

Designed by Sr. Frost

Inside of the Cottage of Mac Nab a Blacksmith at Dalmally who Possesses some Fragments of the Poetry of Ossian

After examining this kind of rude altar, we prevailed on Mac-Nab and his family to proceed no farther. But during this conteſt of politeneſs, another Highlander approached us in an affable manner, and urgently requeſted that we ſhould alſo pay a ſhort viſit to his family, who were aſſembled to receive us.

This man, who was richer and more oſtentatious than Mac-Nab, had made his wife put on her beſt finery, while we were in the houſe of the latter. Her decoration, which appeared to be finiſhed in rather a haſty manner, though with ſome pretenſion to elegance, gave her an air of embarraſſment by no means diſagreeable. She came up to inform us, that the fire was lighted, that the table was covered, and that the moſt excellent whiſkey waited for us. We excuſed ourſelves, as well as poſſible, from want of time, ſhewing her at a diſtance our carriages with the horſes already put to. We then thanked herſelf, her huſband, and the reſt of her company, for their obliging offers, and departed.

But we had ſcarcely gone a hundred paces, when our friend, Patrick Fraſer, ſaid

to

to me :—" You have painfully wounded the " feelings of that family, who are in eaſy " circumſtances, and much reſpected in the " country, by refuſing to enter their habita- " tion, while you viſited that of Mac-Nab. " That ſort of excluſive preference is re- " garded as very humiliating among the " Highlanders." This obſervation made us trace back our ſteps to repair the involuntary injury. But the miſtreſs of the houſe, on ſeeing us return, ſhut the door with an appearance of reſentment, which prevented us from going any farther. We were extremely ſorry to find that we had given pain to perſons of ſo much goodneſs and hoſpitality.

CHAP-

CHAPTER XII.

Departure from Dalmally.—Loch-Awe.—Rocks of micaceous Schiſtus.—Porphyry.—Bun-Awe.—A Cairn, or druidical Monument.—An ancient Chriſtian Croſs in Stone.—Benighted on the Road.—A violent Storm.—Loſe our Way at Midnight.—One of our Chaiſes overturned in a ſmall River.—Pleaſant Adventure with an Old Miller.—Arrival at Oban.

THE diſtance from Dalmally to Oban is about twenty-four miles; and the road is ſo bad, that it is ſcarcely paſſable in carriages. It was ten o'clock before we ſet out, but the day being fine, we thought we might reach Oban by night.

We travelled cloſe by the ſide of Loch-Awe throughout the whole of its length. It is of an oblong form, and more than ten miles long. A road was began to be opened, at a very great expence, about halfway up the chain of hills which border this lake. The

The traveller is here threatened with two great dangers, that of being precipitated from a height of more than four hundred feet into the lake, if a carriage ſhould have the misfortune to overturn in this narrow paſſage, or that of being cruſhed by the enormous pieces of rock which overhang the road, and which frequently fall from the craggy ſummits, to which they are but ſlightly attached. In this ſituation it is prudent to travel on foot in the moſt dangerous places of the road: we, therefore, came out of our carriages; but were repaid for our trouble by a number of delightful proſpects, which were beſt enjoyed in walking. This beautiful lake is full of little woody iſlands. One of theſe is rendered remarkable by the vaſt Gothic ruins of the caſtle of Kilchurn, another by a fortreſs, partly deſtroyed, and a third by an ancient chapel, in a very picturesque ſtyle. High mountains circumſcribe this landſcape, and give it a ſolemn, ſolitary aſpect, which is ſoftened by the fine waters of the lake, by the woods which cover its banks, and by the remains of buildings, which fill the mind with recollections of ancient times.

In

In ſome places, the road reſembles that which leads from Monaco to Genoa, and which is called *The Cornice*. The path is cut through the rock in the ſame manner. The firſt range of mountains, which are the moſt craggy, are compoſed of a grey *lapis ollaris*, divided into very thick banks. Theſe magneſian ſtones vary in the fineneſs of their grain, in their colour, and in their texture. Some of them are in grain and colour ſimilar to thoſe which are in Italy made into culinary utenſils. Others, which are ſofter to the touch, and of a blackiſh colour, are ſuſceptible of a fine unctuous poliſh. Another kind is of a fibrous contexture. Theſe beds are croſſed at different diſtances by veins of white quartz.

We proceeded thus for the ſpace of twelve miles in this difficult road, often cut through rocks, or conſtructed among rubbiſh, without meeting with a ſingle cottage; we only ſaw upon a declivity, ſomewhat woody, a few cabins, which, we were told, were inhabited by colliers.

The nature of the ſtones changes on approaching the thirteenth mile; their colour is a violet-red. Here the moun-

tains recede a little; but their elevation becomes more conſiderable. Theſe mountains are compoſed of porphyry, and the road, which there widens, is formed of the detritus of that ſtone.

On a ſmall arm of Loch-Awe, by which it diſcharges the exceſs of its waters into Loch-Etive, there is a bridge at a place called *Bun-Awe*. The natural canal over which this bridge is built, is called Pool-Awe. Loch-Etive, into which it runs, which communicates with the ſea, and ſtretches up this far among the mountains, is navigable for large veſſels.

The porphyric rocks, which form the neighbouring mountains, have experienced ſo much waſte, either in conſequence of being detached and falling down by their own weight, the operation of froſt, or other deſtructive cauſes, that the baſe of the hills is covered with heaps of porphyry, broken into ſmall pieces. Theſe fragments have accumulated to ſuch a degree, that they form little hills at the bottom of the elevated chain from which they have fallen. This porphyry, which has a baſis of trapp, and is of the colour of the lees of wine, has a great tendency

tendency to ſeparate into angular pieces of various forms.

The cryſtals of felt-ſpar, which enter into its compoſition, are almoſt all of an irregular form: but the moſt remarkable circumſtance, and that which particularly deſerves the attention of the naturaliſt, is that in the ſoil formed of this detritus, there appear fiſſures, where, in conſequence of daily infiltrations, the particles of felt-ſpar have ſeparated from the ſubſtance which contained them, in order to concrete into ſolid bodies, which have a tendency to cryſtallization. Theſe have ſome reſemblance to the felt-ſpar of Baveno, but have not the ſame regularity as this kind of ſecondary regeneration of felt-ſpar is here performed in a very rapid manner.

Theſe cryſtallizations may be ſeen in ſome of the chinks of this moveable ſoil, at a ſhort diſtance from Bun-Awe, upon the right bank of the ſtream that ſerves as an outlet to the loch.

Somewhat higher, and without the bed of the river, there are heaps of broken porphyries, which are harder, and have no tendency to decompoſition. The cryſtals of

felt-ſpar, which are found here, are of the figure of parallelopipeds, pretty regular, and white, while the baſis of the porphyry is a greyiſh red. Some pieces are found in which the baſis is yellow.

Engaged in our obſervations, and employed in collecting ſpecimens of the different ſtones we met with, we did not calculate the time we ſpent at this ſpot. There ſtill remained twelve miles of our journey, and we were aſſured that the road was no better than that we had already paſſed.

We croſſed the bridge of Bun-Awe, beyond which we ſaw two ſolitary habitations, the reſidence of ſhepherds; and about a mile farther on, a ſmall inn, on the wayſide, ſurrounded with a few houſes. We found it neceſſary to ſtop here for half an hour to refreſh our horſes. Meanwhile I viſited a ſmall church, ſituated upon a neighbouring eminence, in the burying-ground of which I obſerved two ſepulchral ſtones, of the ſame kind as thoſe I had ſeen at Dalmally, and the ſculpture of which was equally ancient. They appeared, however, to have ſuffered more from the operation of time.

We ſhould, perhaps, have acted more prudently,

prudently, had we ſtopped all night at this little inn, bad as its accommodation was; for there was no other houſe between it and Oban: but Patrick Fraſer aſſured us that we might proceed, for he had formerly gone the ſame journey; that we had ſtill five hours and a half of daylight; and that the moon, which would ſoon riſe, would light us for the remainder of the road. We followed his advice and departed.

In a few minutes after we had ſet out, we obſerved on the ſide of a hillock, fronting the road, a croſs, formed of black ſtone, of the nature of ſlate, upon which a figure of Chriſt was carved in demi-relievo. The ſtyle of the figure was indifferent, but the execution was fine. The figure, and the croſs were of the ſame piece, and the ſtone was about five feet high.

We were aſtoniſhed to ſee a religious monument of this kind ſo well preſerved in a proteſtant country. An old ſhepherd, who came up while we were looking at it, told us that he had been informed by his parents, that this croſs had ſtood in that place for more than four hundred years; and that although there were no Roman

Catholics in the parish, and though all their images had been destroyed at the reformation; yet this cross had been allowed to remain. He could assign no reason for this singular circumstance, except that the people of the country having been accustomed to see it from father to son, had preserved a kind of respect for it, though they did not pay to it any devotion.

A large column of rough stone was at the same time pointed out to us at the distance of five hundred toises from this cross. We were told that the *Romans had sacrificed upon it to their false gods.* Such were the words of an inhabitant of the country, who appeared to be a school-master, and who spoke a little English. We could not resist our desire of examining this ancient monument more closely, especially as we could do so without going far out of our way. It is a granite, of a yellowish grey colour. Its shape is triangular, but it is as nature formed it; for it is impossible to discover upon it the smallest trace of art. It is erected on a marshy soil, in a kind of peat-moss. I measured it, and found that its height above the ground was ten feet,

and

and that there were four below, which make its length fourteen feet, French meaſure. Its mean breadth I found to be about two feet, and its thickneſs two and a quarter.

At a ſhort diſtance from this pillar there is a circular ſpace, about twenty-four feet in circumference, formed by large blocks of rude granite. It is one of thoſe very ancient monuments, called *a cairn*, that is a Druidical circle *.

We

* Let us liſten for a moment to Pennant, on the ſubject of theſe ancient monuments:

" Take a ride into the country:" (the iſle of Arran) " deſcend into the valley at the head of the bay; fertile " in barley, oats, and peas. See two great ſtones in " form of columns, ſet erect, but quite rude; theſe are " common to many nations; are frequent in North " Wales, where they are called *main-hirion*, i. e. tall " ſtones, *meini-givir*, or men pillars, *lleche*; are frequent " in Cornwall, and are alſo found in other parts of our " iſland: their uſe is of great antiquity; are mentioned " in the *Moſaic* writings as memorials of the dead, as " monuments of friendſhip, as marks to diſtinguiſh places " of worſhip, or of ſolemn aſſemblies (1). The northern " nations erected them to perpetuate the memory of great " actions, ſuch as remarkable duels; of which there are " proofs, both in Denmark and Scotland; and the num-

(1) Joſhua xxiv. 26.

We employed an hour and a half in examining this cairn: our curioſity made us forget that we had ſtill a great way to go, and that the ſun was declining faſt. Heavy clouds began to darken the horizon, and as the day had been very hot, we feared that the night would be attended with ſtorm. We, therefore, deſired the poſt-boys to drive ſmartly, which they were very willing to do, as they obſerved that ſome drops of rain already fell by intervals.

Notwithſtanding the badneſs of the road, we got forward at a good pace for nearly an hour; but night came on, and the clouds ſeemed to daſh againſt each other. We heard the tempeſt growl at a diſtance. The moon was not yet viſible, but had ſhe been riſen ſhe would have been covered with dark clouds. The thunder roared, and vivid flaſhes of lightning ſucceeded each other. We proceeded, however, in ſome

" ber of ſtones was proportionable to the number of great " men who fell in the fight (1): But they were, be- " ſides, erected merely as ſepulchral, for perſons of " rank (2), who had deſerved well of their country." Pennant's Tour, 1772, part ii. page 203.

(1) Wormii. Monum. Dan. 62. 63. Boëthius, Scot. Priſc. et recentes mores, 10. (2) Hiſt. Scot. 20.

degree

degree of ſecurity during half an hour, when with a tremendous clap of thunder, all the force of the ſtorm burſt above us. A deluge of rain poured down. The darkneſs increaſed, and in a few minutes it was not poſſible to ſee the road.

Patrick Fraſer got out of the chaiſe, went before the horſes, and groped with his hands for the track of the road: the horſes, terrified by the noiſe of the torrents, by the lightning and the thunder, moved ſlowly along, and halted at every ſtep. At laſt our conductors adviſed us to come out of our carriages, notwithſtanding the dreadful rain; for they found that we had loſt our way, and were afraid that we might be overturned, and fall down ſome precipice.

We did as we were directed, and it was full time to adopt this courſe; for we were upon the edge of very ſteep rocks, ſome ſupported the chaiſes, ſome held back the wheels, and others endeavoured to find ſome traces of the road. In this manner we proceeded ſlowly onwards, with much trouble and great fear, not knowing where we were, nor where we were going.

At ten o'clock Patrick Fraſer, hearing the noiſe

noiſe of the ſea, ſaid, " We are completely " out of our way, there is no doubt of it. " I cannot tell where we are. Oban, how- " ever, cannot be far off; for we have " travelled a long time, and we now hear " the ſea; it appears that we have got " upon ſome elevated place, and we muſt " uſe all our prudence to rectify this wrong " ſtep."

At midnight our danger and difficulties increaſed; we heard the waves of the ſea daſhing frightfully againſt the foot of the mountain on which we were. This increaſed our fears, and we ſtopped every moment to conſult upon which way we might turn with ſafety.—Such was our ſituation in this wild region: embarraſſed by our horſes and carriages; creeping along ſteep and ſlippery declivities, where it was ſcarcely poſſible to keep our footing, and the rain continuing with increaſed force.

The activity of Patrick Fraſer was great, and he was always the foremoſt upon the look-out. He came back to inform us that it was neceſſary to turn to the left, to avoid falling into the ſea; that he believed he heard a ſtream about two hundred toiſes

diſtant,

diſtant, and that by gaining its bed we might find ſome outlet from the rugged track in which we were involved.

We turned and arrived with great difficulty, at the brink of a ſmall torrent ; but the declivity of the bank was rapid, and the noiſe of the water announced a deep hollow. It was, however, neceſſary to attempt this difficult paſſage through briars and ſtones. The firſt carriage and chaiſe got down without any accident. The ſecond overturned, but was got up before the horſes were hurt, and there was nothing damaged but ſome of our baggage. The third ſucceeded better.

Having entered the bed of the rivulet we coaſted along its banks, walking up to the knees in water. In about a quarter of an hour the noiſe of a caſcade, not far from us, ſuddenly ſtopped our progreſs. A ray of the moon penetrated through the dark clouds, and by its light we obſerved a few tufted trees, a ſmall meadow, and ſome cultivated fields. " We are not far " from a houſe," exclaimed Patrick Fraſer, " we muſt call for help to enable us to get " out of this abyſs."

Wet

Wet from head to foot, trembling with cold, and worn out with fatigue, we aſſembled round our carriages below ſome firs, hollowing as loud as we could, to induce any perſons who might be within hearing to come to our aſſiſtance. This ſcene appeared to me ſo ridiculous, that I could not avoid burſting into laughter; indeed nobody was hurt, and none of us were inclined to be dejected by the accidents that had happened; on the contrary, we rather choſe to enliven the converſation with ſome pleaſantries.

William Thornton, who poſſeſſed a lively imagination, and was paſſionately fond of the ancient poetry of this country, obſerved that the place where we were, was not without charms; that it was calculated to inſpire grand and romantic ideas; and if he had a glaſs of rum to drive away the cold, he ſhould be able to write an ode immediately.—"We are," ſaid he, "among "thoſe mountains which the exploits of "Fingal have for ever ſignalized. The "immortal Oſſian has trod upon this "ground.—His name is dear to the Muſes. "—My imagination warms!"

He

He had ſcarcely repeated theſe words, which he pronounced with a tone of enthuſiaſm, when an old man, with his head uncovered, his hair white, and dreſſed in a floating drapery of the ſame colour, ſtarted up before us. "It is Oſſian!" cried Thornton, "it is the divine poet himſelf! "Let us proſtrate ourſelves before him." The figure, however, which ſaid not a word in reply to this addreſs, and even did not deign to caſt a look towards us, ſtalked gravely acroſs the ſtream, and ſuddenly diſappeared.

Is it an illuſion? Is it a dream? We all exclaimed; for we had all ſeen the ſame object, ſeen it diſtinctly by the light of the moon. We were aſtoniſhed, and remained for ſome time in a ſtate of uneaſy expectation; at laſt we heard the voices of men coming to our aſſiſtance. From them we learned that the water-fall was only the ſluice of two mills, which had been opened, and the white phantom an old miller, who, awakened by our cries, ran in his ſhirt bareheaded to our aſſiſtance; but who, ſeeing horſes and carriages, and hearing a language

language which he did not underſtand, went off, without ſaying a word, to call his neighbours. Theſe obliging highlanders came eagerly to help us out of our difficulties. They could not conceive how our carriages had deſcended the ſteep bank of the ſtream without being daſhed to pieces. It required all the addreſs and ſtrength of theſe athletic men to draw the chaiſes out of this abyſs. They formed a kind of road with pick-axes, and carried the chaiſes, as it were, on their ſhoulders.

They accompanied us to the village of Oban, which was only about five hundred toiſes diſtant, and conducted us to the only inn in the place. They made the landlord riſe, who was not a little ſurpriſed to ſee three carriages, with ten perſons, at his door, at half paſt one in the morning, in ſuch a pitiable condition. We teſtified our gratitude to the good highlanders who had aſſiſted us in ſo frank and hoſpitable a manner. A large fire was lighted to dry us, and after drinking a good deal of tea and ſome rum, we went to bed at four in the morning, and ſlept till ten: the ſleep refreſhed us, and

and except ſome ſlight contuſions, and ſome remaining fatigue, all our troubles were forgot when we roſe.

This adventure may appear ſomewhat romantic; it was notwithſtanding in all its circumſtances as I have related it. Two motives have induced me to mention it. The firſt:—to pay a juſt homage to the fortitude of my dear fellow travellers, who bore the fatigues and the dangers of the night like worthy naturaliſts, and often laughed at this event, which happily had no diſagreeable conſequences. The ſecond:—to be uſeful to thoſe whoſe taſte for natural hiſtory may urge them to viſit this little frequented country, by informing them that it is abſolutely neceſſary to ſet out early from Dalmally to go to Oban; and that if the weather be bad, or any accident delay their progreſs, it would be prudent to ſtop at halfway, and ſleep at the little inn above the bridge of Bun-Awe, however bad the accommodation may be; for, from that to Oban there is no habitation.

The port of Oban is large and ſafe, and were it not obſtructed by ſome ſmall rocks, which might be eaſily removed, it would be capable

of

of receiving a large ſquadron *. Notwithſtanding this advantage, all the ſhipping of this

* Speaking of this port, Knox ſays, " Oban lies in " that part of Argyleſhire, called Mid-Lorn. It has a " good highland country behind, with a freeſtone quarry, " Mull and other iſlands in front, and is of itſelf capa- " cious, and ſufficiently deep for the largeſt ſhips. " Without, is the iſland of Kerera, three miles in length; " between which, and the main land, is the ſound of " Kerera, a good road, through which coaſters and fiſh- " ing veſſels generally paſs, between the Clyde and the " fiſhing grounds in the north highlands. This coaſt, " and the iſland of Kerera, have alſo a free navigation " to the white fiſheries of Bara, and the herring fiſheries " on the northweſt coaſt of Ireland.

" A cuſtom-houſe is already erected, ſomething is done " in ſhip-building, and above twenty families have been " collected together, with a view to the fiſheries.

" But theſe are inferior conſiderations to the natural " advantages which may be derived from this much-fre- " quented harbour and road.

" Oban is formed by nature, and by a combination of " favourable circumſtances, for being a principal har- " bour, a place of trade, a centrical mart for the South " highlands, and the numerous iſlands that lie in its " vicinity."

This author adds the following words in a note. " Mr. " Murdoch Mackenzie was employed by government to " ſurvey the weſt coaſt of Great Britain, from Cape " Wrath to the Briſtol Channel; alſo the coaſt of Ire- " land; which he executed with great attention, and " much to the ſatisfaction of the ſeafaring people of the " three kingdoms. I propoſe, therefore, to corroborate " my own remarks, by extracts from what he calls

" *Nautical*

this place, at the time we arrived, conſiſted of four ſmall veſſels, which had ſailed on the herring-fiſhery, and two wretched boats, which belonged to the brothers Stevenſon.

The voyage we had to make from Oban to the Bay of Arros was at leaſt thirty-three miles, in the rapid currents of the ſtrait which ſeparates the Iſle of Mull from the rugged coaſt of Morven. I did not think it very prudent to attempt this paſſage in a ſmall boat with herring-fiſhers, who did not underſtand a word of Engliſh; upon a ſea, too, which is full of dangers, continually ſubject to tempeſts, and of which both Pennant and Johnſon have given ſo diſcouraging a deſcription.

I had read in the work of the latter the

" *Nautical Deſcriptions of the Weſt Coaſt and Weſtern* " *Iſlands of Scotland, from Cantire to Cape Wrath, and* " *the Butt of the Lewis.*"

Speaking of Oban, he ſays, " In the ſound of Kereray " there is very good anchorage for ſhips and veſſels of any " ſize, and it is a convenient place for veſſels that are " bound either northward or ſouthward. The beſt parts " to ride in, are in the bay of Oban, and oppoſite to Oban, " near Keraray, and between the Ferry-houſe of Keraray " and Ardnachroik, neareſt the latter, on eight or ten " fathoms, without going within the bay; for it ſhallows " faſt near the ſhore."

affecting epiſode of the death of that brave and promiſing youth, Donald Maclean, of Col, who periſhed in the ſhort paſſage from the iſle of Ulva to Inch-Kennet. The impreſſion made upon me by this melancholy narrative was ſo great, that although the ſea was pretty calm, I felt the greateſt repugnance to embark in the ſmall and ill-built boats to be found here, and which could only carry four paſſengers and two rowers *.

I ſhould, however, have overcome this kind of averſion to the voyage, which proceeded leſs from real danger, than the recollection of the indiſpoſition which I always experience at ſea, if our hoſts had not informed me that they expected a ſtout fiſhing ſmack to arrive in two days at fartheſt: this veſſel was to take on board ſome proviſions at Oban, and then to proceed to the Iſle of Sky; and I was aſſured that I might agree with the captain to land me in Mull.

I therefore allowed my companions, who were afraid that bad weather would ſet in, to depart on board of the two little boats

* "To go up the Sound of Mull," ſays Knox, "even "in the moſt favourable ſeaſon, was a dangerous experi-"ment for a ſmall open boat, ſuch as Oban afforded."

which

which the brothers Stevenſon provided, aſſuring them that I ſhould ſail with the fiſhing ſmack, which was ſo ſoon expected, and thus would not be long in rejoining them. Meanwhile, I told them, I ſhould employ myſelf in examining the mountains in the neighbourhood of Oban, which appeared to be very intereſting.

It will be ſeen in the ſequel how this kind of foreboding, which proceeded merely from the caprice of imagination, turned to my advantage. My friends ſailed in the two little boats; and it was agreed that they ſhould wait for me at Mr. Maclean's, in the Iſle of Mull.

I remained, then, alone with a ſervant in this deſert place, at the extremity of Scotland, among men who ſpoke a particular language, perfectly diſtinct from the Engliſh. I could only make myſelf underſtood by ſigns; but neceſſity gives birth to induſtry in every ſituation; and, beſides, I knew that I ſhould remain very little in the houſe. The mountains, which ſurrounded me, were ſo varied, and ſo remarkable, and preſented ſo rich a field of obſervation, that I propoſed to myſelf to examine them with the greateſt

attention. The pleaſures of novelty and inſtruction have a powerful charm, which I ſufficiently felt to indemnify me for ſome temporary privations, and I was convinced that a few days would rapidly paſs away when employed in reſearches of this agreeable kind.

Furniſhed with pen, ink, and paper, to enable me to make ſuch memorandums as I ſhould think neceſſary on the place of obſervation, and taking with me ſome phyſical and mineralogical inſtruments, I ſet out at daybreak, with a knapſack on my back: a domeſtic, my faithful companion, accompanied me, who carried on his part a bottle of wine, and ſome cold meat; which, however, we did not taſte until after ſeveral hours of labour.

We then took our frugal, but excellent, repaſt. Sometimes ſeated on the ſummit of a ſteep rock, ſometimes in a ſequeſtered cavern on the rocky ſhore, where the waves, breaking at our feet, exhibited the ſpectacle of a raging ſea, upon which we rejoiced that we were not embarked.

In the evening I returned to my peaceful habitation, loaded with ſtones and inſtructive notes.

notes. I ſpread all my riches upon a table; I put them in order, and admired them, but I did not contemplate them with the feelings of a miſer; for I amuſed myſelf in planning the diſtribution of what I had collected, among my correſpondents and friends—and I was happy.

The labour of the day made me enjoy my ſupper with particular pleaſure; and ſleep ſoon weighing down my eyelids, I haſtened to bed: it was hard, but, in other reſpects, good, and fatigue converted it into down.

But there is no perfect happineſs in this world. Will it be believed that a muſic of a kind new to me, but ſhocking to my ear, deprived me of the repoſe I ſo much wanted? I had ſcarcely time to lie down in bed when an unlucky piper uſed to come and place himſelf under my window. At firſt he waited upon me every evening in the paſſage of the inn, to regale me with an air; he afterwards took his ſtation in the front of the houſe, where he made his noiſy inſtrument reſound until eleven o'clock, and I could fall upon no means to prevail upon him to be ſilent. He thought his muſic was agreeable to me, and it was his wiſh to do

me a kind of honour, of which I in vain endeavoured to convince him I was unworthy.

On the day of our arrival, this man came under the windows of the room into which we were ſhewn: with a bold countenance, and a martial air, he walked backward and forward, ſtunning us with ſounds of the moſt unharmonious kind. At firſt we imagined that he was a kind of madman, who earned a livelihood by this ſtrange exhibition; but Patrick Fraſer aſſured us, not only that this honeſt man was in his ſenſes, but that he had the reputation of being an excellent muſician of the highland ſchool; that his principal intention in playing on his inſtrument before us was to exhibit his joy at our arrival in a country ſo ſeldom viſited by foreigners. Affected by this hoſpitable motive, I was prodigal in my applauſes on his art, and begged of him to accept ſome ſhillings, which he at firſt refuſed, and ſeemed only to receive that he might not diſpleaſe me. He played always the ſame air, if I may give that name to a kind of compoſition unintelligible to foreigners, but which brings to the recollection of the highlanders events which have the greateſt intereſt with them. The

piper had obſerved that my companions were gone, and he perſuaded himſelf that I remained behind to hear his muſic: imagining, therefore, that his concerts would be moſt agreeable to me in the ſilence of the night, he continued his ſerenade under my window to eleven or twelve o'clock. Nothing could induce him to deſiſt. I roſe one evening with great impatience; but not being able to make myſelf underſtood by ſpeech, I took him by the hand to lead him to a diſtance. He returned, however, eagerly to his old place, as one who was determined to diſpute a point of politeneſs, expreſſing, by his geſtures, that he was not at all fatigued, and that he would play all night to pleaſe me; and he kept his word. Next day I forced him to accept a ſmall preſent, and made ſigns to him that I did not wiſh to hear him any more; but he was not to be outdone in civility; and that very evening he returned, and made his pipe reſound until midnight, playing conſtantly the ſame air*.

There

* "The ſolace," ſays Johnſon, "which the bagpipe "can give, they have long enjoyed; but, among other "changes, which the laſt revolution introduced, the uſe "of the bagpipe begins to be forgotten. Some of the

There are at Oban ſeveral ſpecies and varieties of very curious rocks, which occupy a ſpace of about eight hundred toiſes along the ſhore, and one thouſand or eleven hundred broad: this vaſt collection of different ſtones, depoſited here by nature, in conſequence of ſome great revolution of nature, deſerves the attention of thoſe who love ſtudies connected with the theory of the earth.

A boiſterous ſea, which beats furiouſly againſt the ſteep rocks, that ſerve it for a barrier, has diſcloſed the ſtructure of theſe hills, which appear to have been heaped one above another by terrible convulſions, and by the action of the two elements of fire and water, in conſtant oppoſition to each other.

The baſes of theſe mountains are ſo worn away, that their flanks are, in a manner,

" chief families ſtill entertain a piper, whoſe office was " anciently hereditary. Macrimmon was piper to Mac- " leod, and Rankin to Maclean of Col.

" The tunes of the bagpipe are traditional. There has " been in Sky beyond all time of memory a college of " pipers, under the direction of Macrimmon, which is " not quite extinct. There was another at Mull, ſuper- " intended by Rankin, which expired about ſixteen years " ago. To theſe colleges, while the pipe retained its ho- " nour, the ſtudents of muſic repaired for education. I " have had my dinner exhilarated by the bagpipe at *Armi-* " *dale*, at *Dunuvegan*, and in *Col.*"

laid

laid open, which gives the obſerver an opportunity of ſtudying the materials which compoſe them. He is at firſt aſtoniſhed to find ſo much variety and ſo much confuſion. However great his knowledge, he would ſoon find himſelf puzzled, if the veſtiges of ſubterraneous fires, which are eaſily recognized, did not enable him to explain this diſcordant collection, ſo contrary to the uſual courſe of nature.

I examined and re-examined theſe different materials, with great perſeverance; and, far from being diſcouraged by this chaos, I felt an increaſing intereſt in exploring it. I was animated alſo by the deſire of being uſeful to thoſe who ſhould viſit the ſame place after me, by fixing their attention on the moſt remarkable objects, and preſenting them with the ſketch of a labour which may put it in their power to make more diſcoveries than I have done, without having the ſame difficulties to encounter.

CHAPTER XIII.

Natural Hiſtory of the Environs of Oban.

I HAVE thought it convenient to adopt the following diviſion for the more orderly arrangement of my obſervations.

Calcareous Matters.

Though the mountains of Oban are, in general, compoſed of argillaceous ſchiſtus, lapis ollaris and ſteatites, or of trapps, porphyries, and compact or porous lavas, and ſometimes of a mixture of all theſe ſubſtances united and agglutinated together, yet there are alſo found in them calcareous ſtones.

This ſtone, which is here of a black colour, may be ſeen on the beach, at a little diſtance from the inn to the right. It is diſpoſed in fiſſile ſtrata like ſlate, but is, at the ſame time, hard, ſonorous, and nowiſe tranſparent in its fracture. It has a fine grain, and ſplits into plates from an inch to an inch and a half thick. The beds, which lie above each other

other in a kind of thick banks, incline towards the ſea in an angle of thirty-five degrees. They are interſected in different directions, ſometimes tranſverſely, by veins ſeveral inches in depth and thickneſs, of a very white, hard ſtone, the grain of which is ſo fine and cloſe, that, at firſt view, one is apt to take it for fat quartz.

All theſe black fiſſile ſtones are calcareous, containing only a twenty-eighth part of argillaceous earth, mixed with a very ſmall portion of magneſian earth. The white veins conſiſt of pure calcareous ſpar.

The ſtone is burnt in a kiln formed on the ſpot, and yields a lime of very good quality, but which, to render it more active, is mixed with an equal proportion of a ſomewhat purer ſtone, found in the iſle of Liſmore, and carried in boats to the foot of the kiln. The mixture is effected by calcining them together.

It is of importance to know this beforehand; for the ſtone of Liſmore, having almoſt the ſame colour and the ſame fiſſile texture as that of Oban, and being placed beſide each other at the foot of the kiln, one might be eaſily led into the error of ſuppoſing that they are found in the ſame place. I did not obſerve

obſerve in either of them, any veſtige of marine bodies.

Argillaceous Schisti.

Proceeding along the ſhore to the left, and paſſing below a ſingle houſe belonging to Mr. Cambel, one reaches a ledge of craggy rocks, lying in an inclined plane, and completely bare for a ſpace of ſeveral miles. The ſea beats upon it ſo furiouſly, that it has every where torn and furrowed this kind of natural mole, though formed entirely of hard rock.

This excurſion ſhould be made during the ebb-tide; for the beds of rock have ſo rapid a deſcent towards the ſea, the ſurf is ſo violent, and the waves riſe ſo high with the leaſt wind, that to viſit the place at any other time would be attended with evident danger.

Here prevails almoſt the ſame order of things, the ſame diſpoſition of the fiſſile beds, the ſame colour of ſtone, and the ſame white veins, as in the calcareous quarry already deſcribed. But the proportion of the conſtituent parts is completely inverted. The ſtone of this vaſt tract makes but a ſlight and ſhort effervescence, with nitrous acid; the calcareous earth ſcarcely forms a twenty-eighth

eighth part of its compoſition; and the remainder is a mixture of a quartzoſe and argillaceous earths, with a very ſmall portion of magneſia. The white veins, inſtead of calcareous ſpar, are of white ſemi-tranſparent quartz, which ſtrikes fire copiouſly with ſteel, and does not make the leaſt effervescence with acids.

But it deſerves to be remarked, that though the diſpoſition of the beds and the white veins is the ſame as that of the lime-quarry, there are alſo ſeen other ſlender veins, of a matter like that of the beds themſelves, interrupting their courſe, and croſſing them in various directions.

Theſe veins, ſome of which are more than a foot thick, are themſelves divided into a ſort of net-work chinks, of a triangular, quadrangular, or rhomboidal figure, and theſe interſtices are filled with threads of white quartz, which have a very ſhowy appearance, on the black ground of the ſtone.

It may be preſumed, that this interſection of the beds owes its firſt origin to ſudden depreſſions of the earth, which have broken it into chaſms; and that theſe have been ſubſequently filled with ſome ſtony matter which,

which, by ſhrinking and cracking itſelf when in a ſoft ſtate, has produced this moſaic work, theſe ſportive fancies of nature, which affect a ſort of regularity.

Some portions of theſe veins may be broken off, which are worthy of a place in the cabinets of the curious. Theſe remarkable pieces are formed ſometimes in quadrilateral priſms, from ſeven to eight inches long, and three inches thick, and theſe priſms are themſelves divided into a multitude of ſmall rhombuſe, which ſeem as if ſoldered together by ſome lineaments of white quartz.

On aſcending this rugged tract to a certain height of the mountain againſt which it reclines, the ſame matters again make their appearance. But the fiſſile beds reſume the horizontal direction; the colour of the ſtone is not ſo black; the texture is ſofter, and the argillaceous earth is found in a greater quantity.

The appearance of the place ſeems to indicate that the ſteep crags which I have mentioned, however conſiderable in extent, have once belonged to the neighbouring mountain; from which they have been detached by ſome great convulſion, or what

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is ſtill more probable, by the continued action of water, fretting and undermining their baſis.

To complete the whole, on proceeding about forty toiſes up the entire part of the mountain, and where the horizontal poſition of the ſtrata ſhew that they have not been removed, there appear ſome real volcanic products, which form a new order of things; which I ſhall take notice of preſently. But I ought firſt to mention the rocks of trapp and porphyry, which are imbodied amidſt this aſtoniſhing aſſemblage of various ſubſtances ſo heterogeneous in appearance.

Trapps and Porphyries.

Aſcending a ſteep path which paſſes by a group of four or five fiſher-houſes, there is a quarry, which is two hundred and ſixty feet above the level of the ſea, and ſituated near an old wall on the top of the mountain, and in front of the harbour. This is the ſpot which ought to be ſelected for mineralogical obſervations.

This quarry preſents a naked crag, more than forty feet high. The firſt conſiderable ſtrata, that is, thoſe which ſerve as a ſupport to the others, are formed of nearly horizontal

zontal layers of a greeniſh ſtone, in general hard, a little ſonorous when ſtruck with a hard body, rather dry than unctuous to the touch, though of a very fine grain. Its external appearance is that of a hard ſteatites.

But on a more cloſe examination, it is found to be a ſtone of the nature of trapp, which fuſes with the blow pipe into a black glaſs, and is compoſed of a mixture of ſchorl in impalpable particles, with a little quartzoſe, argillaceous, and calcareous earths. The ſchorl is the moſt copious ingredient. The greeniſh colour of the maſs proceeds from iron. The beds vary in thickneſs; the ſmalleſt being one foot ſix inches, and the largeſt from ſeven to eight feet, thick.

Several of the beds, being of a leſs adherent texture, have ſuffered a certain degree of alteration, which has rendered their grain friable.

To theſe banks ſucceed others of an appearance leſs greeniſh, and bordering on deep grey; in the ſubſtance of which are ſeen a multitude of ſmall cryſtals of felt-ſpar, white, hard, and ſhaped in parallelopipeds.

In proportion as the rock of trapp paſſes into the ſtate of porphyry, by the addition of felt-ſpar, the horizontal poſition of the ſtrata changes

changes, or rather the matter no longer aſſumes the form of ſtrata. It appears, on the contrary, in that of a large maſs, divided by cracks from top to bottom. Theſe irregular fiſſures, which are ſometimes more than an inch wide, produce enormous blocks of a longitudinal form, which often cohere ſo ſlightly, that, loſing their equilibrium, they fall with a craſh to the bottom of the quarry, where they break into a thouſand ſplinters, preſenting an excellent choice of ſpecimens, and an intereſting object of ſtudy, to the naturaliſt.

It is deſerving of attention, that the cryſtals of felt-ſpar are not interſperſed through every part of the rock. There are ſome parts where not one is to be ſeen, whilſt other parts are entirely covered with them. Theſe accidental porphyries, if I may uſe that expreſſion, do not affect any regular form. They ſeem to have been ſcattered at random; and appear in large irregular ſpots, ſome of which are ſix feet in ſurface, and others leſs.

But theſe ſpots, in which the porphyry is ſo diſtinguiſhable, cannot be ſuppoſed to be produced by blocks of that ſtone accidentally

imbodied in the ſubſtance of the trapp; for the ſameneſs of the baſis of both, and local appearances, do not admit the ſlighteſt doubt upon the ſubject. It is much more natural to ſuppoſe, that in the places where its conſtituent principles are found, cryſtallized in the form of ſalts, the union of the particles of felt-ſpar was effected by the laws of affinity, at an epoch when the ſubſtances which enter into the compoſition of this rock, were diſſolved and ſuſpended in the aqueous fluid.

Beſides theſe porphyries, which exiſt in an aggregate ſtate, one may obſerve here a very great variety of others in the form of pebbles, or rounded ſtones, which the ſea throws in immenſe quantities upon the beach; ſo as to induce one to think that whole mountains of that matter have been ſhivered in pieces by means of ſome terrible convulſion. The following particulars will ſhew whether this ſuppoſition be, or be not, probable.

Lavas and other volcanic Products.

The environs of Oban abound in compact lavas, of the nature of baſaltes, which deſerve by their poſition, as well as the matters they have overſpread, to fix the attention

tion of thoſe perſons to whom ſuch reſearches are agreeable and familiar.

Theſe burning currents, vomited by ſubterraneous fires, have, at very remote periods, ſtreamed along the flat heights, and flowed into the hollows, and the chaſms of the different mountains which ſkirt this craggy coaſt. By attending to this fact, it may be poſſible to elucidate the ſtate of the mountains, before the eruption of theſe ancient volcanos.

The lavas found here are almoſt excluſively of the compact kind. The baſaltes is, in general, very homogeneous; for, with the exception of a few ſpecks of black ſchorl, which may be ſometimes met with, it contains no extraneous ſubſtance. This baſaltes is hard, ſonorous, and of a fine black colour.

In ſome parts the compact lava aſſumes the form of currents, whilſt in others it projects into peaks, or vaſt pyramids, which ſeem to have originated amidſt the moſt terrible ſhocks and convulſions, at a period when ſubterraneous conflagrations burnt and liquefied every thing within the reach of their devouring flames.

Several of theſe volcanic peaks are ſplit in priſmatic diviſions, more or leſs regular,

which ſometimes exhibit gigantic colonnades, particularly in the quarter oppoſite to the iſle of *Kerera*. At other times the priſms are of a ſmaller ſize, but of a more perfect configuration.

About a mile from Oban, on the road to Dunſtaffage, and by the ſea-ſide, is a volcanic eminence, eaſily diſtinguiſhable by an old half ruinous caſtle which ſtands on its ſummit. The whole ſouth ſide of this eminence is formed of an aſſemblage of baſaltic lumps of a ſmall ſize, but, in general, very round, and ſeparable into foliated pieces adapted to each other, as far as the centre, without diſcovering any ſubſtance which might have ſerved as a nucleus. On the ſame ſide, towards the right when viewed in front, are ſeen a multitude of ſmall, very regular, five or ſix-ſided priſms, the lava of which is decayed. The angles of theſe priſms break off by a ſort of natural decompoſition, and thus produce round balls, which ſeem to riſe out of the midſt of the priſms. I remarked a ſimilar appearance in ſome priſms of a larger ſize in the environs of Glaſgow.

There is alſo found in the vicinity of Oban, a porphyric lava, which, notwithſtanding the ſtate of fluidity it muſt have

paſſed

paſſed through, ſtill preſerves its cryſtals of ſelt-ſpar; neither the white colour nor grain of which have undergone but a very ſlight alteration. This lava is magnetic, and may be referred to ſpecies XX, in the 77th page of the work which I have publiſhed under the title of "Mineralogy of Volcanos," and in which I have deſcribed ſimilar lavas of the iſland of Lipari.

But nothing is more ſingular than the effects produced by a current of lava on the argillaceous ſchiſti, which I but ſlightly mentioned under that title, when deſcribing a ſteep craggy tract that reclines againſt a mountain.

On reaching the ſummit of this mountain, which likewiſe reclines againſt a ſtill higher one, there appears a current of baſaltic lava, which iſſuing from the latter, covered the flat horizontal top of the former, and then flowed from caſcade to caſcade along the declivity that fronts the ſea.

The face of this tract evidently announces, that at the period when the lava was diſcharged from this ancient volcano, there already exiſted extenſive chaſms and hollows. The lava runs along the ſurface of the ſoil,

as if it had been caſt on a mould, and follows all the accidental forms which occur from the ſummit to the baſe of the mountain.

This volcano was ſubmarine; of this it would be eaſy to bring ſeveral proofs. But for the ſake of brevity, I ſhall confine myſelf to one only, which may be eaſily comprehended by the greater part of readers, and by thoſe even who are leaſt verſant in the natural hiſtory of volcanos.

In deſcribing argillaceous ſchiſti of the nature of ſlate, in a preceding part of this chapter, I ſtopped at their point of contact with a baſaltic lava. I there ſtated, that the colour of the ſchiſtus became fainter at the height of fifty toiſes above the level of the ſea, being rather grey than black; that argillaceous earth predominated moſt in it; and that the ſtrata, which rapidly inclined near the bottom, were horizontal, particularly in certain parts, towards the top of the mountain.

Where theſe changes commence, one may eaſily find ſeveral places, where the beds of ſchiſtus are pretty thin, and where they are alſo divided into a multiplicity of forms, the moſt numerous of which are rhomboidal, triangular,

triangular, and quadrilateral. As theſe ſolid pieces may be eaſily ſeparated; one may ſelect ſeveral which poſſeſs the greateſt regularity, though their forms are the reſult of mere contraction and not of cryſtallization.

The ſchiſti thus ſhaped are certainly not volcanic products themſelves, though they are found covered with lava. It is, beſides, very ſingular, that neither their conſtituent parts, nor even their colour, have ſuffered the ſlighteſt alteration from the burning and melted maſs that has cloſely overſpread their ſurface. I proceed to give a proof of this. Theſe ſchiſti are of ſuch a nature, that, on expoſing one of the rhomboids taken from immediately below the lava, to the action of a pretty ſtrong ordinary fire, it ſoon aſſumes a deep brick-red colour. The ſame effect would have, doubtleſs, been produced by the boiling lava, had it come in immediate contact with the ſchiſti in ordinary circumſtances.

It muſt, therefore, be inferred, that ſome intermediate body, ſuch as water, diminiſhed the action of the fire; and the moſt natural conſequence is, that this was a ſub-marine

volcano; inaſmuch as it has not, in any reſpect, altered a ſubſtance ſo ſenſible to the operation of fire as this delicate ſchiſtus, that ſo rapidly paſſes to a red colour by the caloric oxydifying the ferruginous particles intermixed in its texture.

After having made ſome experiments reſpecting the action of ordinary fire on theſe ſchiſti, whilſt I was meditating upon the intereſting fact, and writing my obſervations upon a table of lava, that reſted on the ſchiſtus, in the place which I have juſt deſcribed, I diſcovered, that on paſſing my hand under the table, I could draw out as many as I choſe of the ſmall rhombuſes of ſchiſtus. The plain reaſon of this was, that the lava, by contracting its bulk as it cooled, left a vacancy of ſeveral inches wide, below the ſlab, which was in no part above three feet thick, and which adhered by one ſide to a more conſiderable maſs of lava.

As I examined theſe ſmall priſms of ſchiſtous ſtone, ſeveral of which were three inches long, I thought of trying ſome of them with the loadſtone. I was aſtoniſhed

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to find that they were ſtrongly magnetic on the ſide next the lava, whilſt they were nowiſe ſo on the oppoſite ſide.

It was natural, upon this diſcovery, that I ſhould endeavour to aſcertain to what depth the attractive property extended.—This was effected the more eaſily, as the ſmall priſms, on being dexterouſly ſtruck with a hammer, ſplit into plates of from half an inch to three or four lines thick. I was accordingly enabled, with the aſſiſtance of a very ſenſible magnet, to determine that the part of the ſchiſtus next to the lava, had no magnetic power beyond the depth of fourteen lines.

I then made uſe of powerful magnifying glaſſes, to examine whether the attractive parts had received any ferruginous particles by infiltration from the lava, which is itſelf ſtrongly magnetic. But I could diſcover nothing to confirm that conjecture. The texture of theſe ſchiſti appeared to me abſolutely homogeneous, and of the ſame nature throughout; being of a fine grain, pretty ſoft to the touch, and without any viſible particle of iron.

But if we conſider that the portions of black

ſchorl

ſchorl which are found in quartz and granite, and which are not in the leaſt magnetic in their primitive ſtate, become ſo by the action of fire, as we may be eaſily convinced of by heating them in a common fire, and as may be ſeen on a grander ſcale in the immenſe quantity of ſchorl cryſtal found on Mount Ætna; we muſt conclude that the preſent ſchiſti are, in part, compoſed of a pulverulent ſchorl, the general characteriſtics of which eſcape obſervation from the tenuity of their particles; and that wherever the heat of the lava has penetrated them, their attractive property diſplays itſelf.

Theſe ſmall priſms of ſchiſtous ſtone may, therefore, be regarded as excellent pyrometers, for determining, by comparative experiments, what muſt have been the heat of the lava, the effect of which was moſt certainly counteracted by the operation of water. For, had it been otherwiſe, and had not the volcano been ſubmarine, I muſt repeat that the burning lava would have acted in a different manner upon the ſchiſti. Inſtead of rendering them ſimply magnetic, which does not require a violent heat, it would have changed them to a red brick colour;

colour; and this alteration always takes place, as I have ſtated already, on expoſing them to a pretty active fire. I have made ſeveral experiments in my laboratory, which confirm what I have now advanced reſpecting ſchiſti of this kind. I reſerve them for a work that will, with more propriety, admit thoſe details, which are too minute to find a place here.

The only varieties which I was able to find in the environs of Oban, may be claſſed under the following numbers:

No. 1. Compact baſaltic lava, pure, black, hard, without any extraneous body, fuſible into black glaſs with the blow pipe, and diſpoſed in extenſive currents.

No. 2. *Idem* in priſms, a number of which are united into cauſeways of a great height, on the brink of the channel facing the iſle of Kerera.

No. 3. *Idem* in ſmall round lumps, which exfoliate in proportion to the degree of alteration which the lava has ſuffered.

No. 4. *Idem* with ſome globules of white calcareous ſpar, not very abundant in general.

No. 6. Porphyric lava, forming currents,

rents, and ſometimes divided into priſms, more or leſs regular.

No. 7. Porous lavas, of a reddiſh, or ſometimes black-grey colour, more or leſs hard, and often ſo fuſible and decayed, that they moulder into an earthy duſt. Theſe and the lavas containing globules of calcareous ſpar, are found only in maſſes of a particular pudding-ſtone, which I ſhall preſently deſcribe.

From this account it appears that the lavas remaining in their original place afford but few varieties, though they exiſt in enormous maſſes and currents. This is only what might be expected; as the craters, and the ſcoriated lavas which ſurround them, have ſo completely diſappeared, that it is no longer poſſible to trace the place occupied by thoſe terrible breaches. It ſhould ſeem, therefore, that poſterior to the eruption of theſe ancient volcanos, there muſt have occurred cataſtrophes of a different nature, which have ſwallowed up theſe dreadful orifices, and diſperſed to a diſtance the ſcoriæ, pumices, aſhes, and other ſubſtances diſcharged by the volcanos.

What remains for me to obſerve reſpecting

ſpecting the laſt lithological object of the environs of Oban, may ſerve as a ſupplement to what I have now ſtated.

Remarkable Pudding-stones, forming natural Walls of great Thickness, and of a considerable Height.

In my "*Mineralogy of Volcanos*," page 334, I thought it neceſſary to make a diſtinction between breccias and pudding-ſtones.

Wherever the fragments of any ſtone, preſerving their angles, are united and agglutinated by a natural cement, I give that aggregate the name of *breccia*.

But if the ſtony fragments, on the contrary, have their angles flattened and worn, or are of an oval, or round form, whatever be the nature of the pieces, or of the gluten which connects them, I apply to them the denomination of *pudding-ſtones*.

This diſtinction appeared to me neceſſary, becauſe it ſerves to mark two different modes of exiſtence, and preſents to us inſtructive characteriſtics. In fact, ſplinters and fragments of ſtone which have preſerved their angular form do not indicate that,

that, after being torn from their primitive poſition, they have been the ſport of waves, and a long time ſubject to the impetuoſity of currents, which might have tranſported them to a diſtance. Had this been the caſe, their angles would have been worn away. Their appearance, therefore, ſhows that they have never been removed from their original ſituation. But thoſe ſtones which have loſt their angles, and aſſumed forms completely ſimilar to thoſe produced by the continued attrition of ſome hard bodies, on being rubbed againſt each other in every direction, neceſſarily ſuppoſes a violent and long-exerted action, which muſt have carried them to a diſtance, or, at leaſt, have kept them, for a long time, in convulſive agitation.

The traveller ſees with aſtoniſhment, in the environs of Oban, vaſt walls of pudding-ſtone, ſome of which are more than two hundred feet high, and ſixty feet thick. Theſe walls extend uninterruptedly along the coaſt, from the right ſide of the harbour, fronting the ſea, to a diſtance of more than three miles.

This kind of natural rampart forms, in ſome

ſome parts, a dyke, which has reſiſted, for many ages, the impetuous fury of the waves of a ſea almoſt inceſſantly agitated with tempeſts. In ſome parts it varies in its height, whilſt, in others, it is detached on every ſide, and perfectly imitates the walls of an immenſe coliſœum, which may be traverſed and examined in every direction.

But this ſingular wall more generally reclines againſt a chain of perpendicular mountains, which ſurround the coaſt, and which it adheres to, or, as it were, incruſts. In fine, this remarkable pudding-ſtone, formed by a natural cement of the greateſt hardneſs, is ſometimes ſhaped into inſulated peaks, which riſe in the form of pyramids, or needles, and preſent the idea of grand monuments, erected by human hands. I declare, that from the time I have made natural hiſtory my principal occupation and pleaſure, and during my numerous travels, I have never met with an object of this kind which ſo much aſtoniſhed me. The pyramidical rock of St. Michael, ſituated in the midſt of the town of Puy, in the Velai, is doubtleſs a very extraordinary object,

object, from its conical ſhape, and its great elevation. But it is compoſed entirely of lava, and owes its origin to a current of melted matter, which burſt upwards from the earth, and ſettled upon itſelf, as it congealed by the action of the cold air. But how have theſe peaks, compoſed of inlaid ſubſtances, cemented to each other, been produced? This is a queſtion of difficult ſolution. Let us try whether the different ſtones of which theſe maſſes are formed can enable us to propoſe ſome probable conjectures upon the ſubject.

THE DIFFERENT STONES WHICH ENTER INTO THE COMPOSITION OF THE PUDDING-STONES OF THE ENVIRONS OF OBAN.

1. White quartzes, ſometimes reddiſh, of great hardneſs, giving fire with ſteel, ground and rounded on their ſurface, rather circular than oval, and varying from the ſize of a hen's egg to that of a ſmall cannon-ball.

2. Oval and rounded fragments of greeniſh trapp, and of grey trapp, reſembling the porphyric

porphyric rock deſcribed above. The texture of theſe rounded trapps ſeems to be a little altered.

3. Argillaceous ſchiſtus, black, hard, and ſomewhat calcareous, nearly of the ſame nature as that found on the craggy ſteep which I have mentioned.

4. A black, calcareous, and ſomewhat argillaceous ſtone, reſembling that of which lime is made at Oban.

I ought to obſerve here, that this ſtone, as well as the preceding, being much ſofter than the others, and diſpoſed in rather thin layers, the round fragments found in the pudding-ſtone are never larger than a ſmall walnut.

5. Porphyries, of greeniſh, grey, and yellowiſh grounds. The laſt are moſt plentiful; all poſſeſs great hardneſs; and their cryſtals of felt-ſpar, are parallelopipedal, opake, and of a milky white. Theſe porphyries are all round or oval, and in general of the ſize of one's fiſt, though ſometimes larger. Several of them move the magnet, whilſt others make no impreſſion upon it.

6. Compact, black, baſaltic lava, producing with the blow-pipe a black enamel,

attractive of the magnet. This lava, which is itſelf magnetic, is, in general, very ſound, but it is ſometimes alſo a little altered. Its fragments are all round or oval.

7. Porphyric lava of the ſame form. Several pieces have ſuffered no injury in their texture, whilſt others are altered, and even ruſted. All of them, however, are magnetic.

8. Porous lava, ponderous, black, and ſometimes reddiſh, having its cellulæ filled with calcareous ſpar. This lava is, in general, altered, and a little earthy.

9. Porous lava, grey, black, or reddiſh, the cellulæ of which are empty. Theſe lavas are ſo altered, that they are friable to the fingers, and fall into gravelly powder.

All theſe different ſtones are, I repeat, rounded or oval, of a greater or leſs ſize, in proportion to their different degrees of hardneſs, thrown together, and intermingled without order, and agglutinated with a cement ſo hard, that it is exceedingly difficult to ſeparate them with a hammer, which in general rather breaks than disjoins them.

It is not very eaſy to determine accurately the nature of the gluten, which has ſo intimately

timately conſolidated theſe immenſe maſſes of different kinds of ſtone. The ſmalleſt interſtices, and the leaſt cavities, are ſo cloſely filled up with a kind of gravelly ſand, conſiſting of a ſort of *detritus*, produced by a decompoſition of all the amalgamated ſtony ſubſtances, that it is a matter of extreme difficulty to diſtinguiſh it.

On examining, however, the moſt attenuated parts of this cement, with powerful microſcopes, it is found that the pulverulent remains of lavas predominate in it, in general, and that a kind of lapidific juice, of a very fine and ſubtile nature, has joined the whole in the moſt intimate union. I threw ſome particles of this cement, which I detached with the point of a knife, into aqua fortis, and I diſcovered, from this experiment, that it conſiſted of a mixture of quartz, and of calcareous matter, in which the firſt is moſt predominant.

The more one examines this immenſe aſſemblage of ſtony ſubſtances rounded by attrition, the more one ſtudies the form of theſe enormous maſſes, their poſition in the vicinity of lavas, and their phyſiognomy (if I may uſe the expreſſion)—the more alſo are

they found to differ from the ordinary beds of pebbles, which the waters have accumulated in ſuch great abundance in various places. One is, therefore, induced to compare them to certain volcanic eruptions, in which water, heated to the higheſt degree of ebullition, enters into concourſe with fire, and the different elaſtic emanations generated by ſubterraneous combuſtion. This may have been the cauſe of theſe ſudden and tumultuous petrifactions, of which the remains of ancient extinct volcanos every where afford us examples.

I am thence pretty much inclined to aſcribe the origin of theſe aſtoniſhing ramparts and huge pyramids of pudding-ſtone, to volcanic eruptions of a ſimilar nature. For it muſt be ſuppoſed that the ſea experiences furious convulſions, when its bottom is rent aſunder by violent exploſions and earthquakes, produced by water converted into the ſtate of vapour by theſe terrible combuſtions. Vaſt quantities of matter muſt then neceſſarily be diſplaced; pebbles and ſtony fragments are united and blended with ſlime, ſand, and volcanic rubbiſh of every ſort, which act as a cement;

and

and there thence reſult ſolid maſſes, which are enabled to adhere together afterwards, by the effect of a gluten ſo much the more tenacious, as it is produced by the two moſt active ſolvents known, namely, fire and water.

Important conſequences might, doubtleſs, be drawn from ſuch intereſting facts. But thoſe naturaliſts, who are particularly converſant in the natural hiſtory of volcanos, will be better able to comprehend and to apply them than I am. Beſides, this is not the place to enter upon ſuch a diſcuſſion, of however great importance it may be. I am rather apprehenſive that I may be accuſed of having already entered into details which have been perhaps too minute. But the mountains, and the lithology, of the environs of Oban preſented objects ſo intereſting, both from their variety and poſition, and which were ſo little known, that I conceived that naturaliſts would be ſomewhat obliged to me for giving them an account of my reſearches.

Of the Scotch Parsley, or Ligusticum Scoticum.

It now remains for me, before taking leave of the mountains of Scotland, to mention a plant, which is in high repute among the natives of the country, as well for the medical virtues which they aſcribe to it, as for its various culinary uſes. This plant is the *liguſticum Scoticum* *, which I found growing by the ſeaſide in great abundance, both in the environs of Oban and Inverary.

Robert Sibbald, in his work entitled *Scotia*

* Liguſticum Scoticum. Lin. L. Foliis bitternatis. L. Sppl. pag. 359. L. Foliis duplicato ternatis. L. Hortus. Cliffortianus, 97. Flora Suæ. 232. 244. Iter Wgoth 182. cum deſcriptione. Apium maritimum. L. fl. lapp. 107. Liguſticum Scoticum appii folio. Tournefort, inſt. 324. Apium maritimum quibuſdam, potius imperatoriæ affinis planta. Sibbald. Scotia. illuſtr. t. xiii. fig. 3, mala Liguſticum humilius Scoticum a maritimis. Seu apium maritimum dulce Scoticum. Pluk. Alm. 217, t. xcvi. fig. 2. mala. Seſeli maritimum Scoticum. Herm. p. 227, t. ccxxvii. Rivin. Pent. Ireg. t. 59. Apium Scoticum, et apium marinum quibuſdam. l. Newton. Rai Hiſt. 447. Æder Flora Danica, t. ccvii. Gunner Flora Norvegica, p. 85. Angelica Scotica, petiolis foliorum tripartitis, ramificationibus, pininatis trifoliatis, foliis rhombeis, inciſolobatis, ſerratis. Lamark, Encycloped. Meth, tom. i. p. 173.

Illuſtrata,

Illuſtrata, publiſhed at Edinburgh, in 1684, was, I believe, the firſt who deſcribed and gave an engraving of that plant. The deſcription, however, is but indifferent, and incomplete, and the figure is badly finiſhed.

Pluknet has alſo given a repreſentation of it in his collection, page xcvi. But it is engraved from an incorrect drawing, which does not preſent a true likeneſs of the plant.

This want of a good repreſentation of it, has induced me to give one in the preſent travels, which ſo often treat on ſubjects of natural hiſtory. I publiſh it with the greater pleaſure, as my intention has received the approbation of three of our moſt celebrated botaniſts, Juſſieu, Lamark, and Desfontaines, for whom I entertain as much reſpect as perſonal friendſhip.

The plant is drawn by Marechal, an excellent painter in natural hiſtory, and engraved by Sellier, whoſe talents in this line are well known. (See plate III.)

Ray, to whom James Newton had tranſmitted ſome account of the uſes of this plant, ſtates, that the latter was informed in the country that the highlanders of Scotland ate ſome *liguſticum* every morning, in the perſuaſion

ſuaſion that it was an antidote which would preſerve them from all ſickneſs during the day. " *Mihi (inquit) ibi notum eſt, Scotos* " *montanos, apud quos copioſe oritur, quotidie* " *mane eam eſitare, quo ſe tutos eſſe per-* " *ſuadent toto die a quavis contagione.*" Rai, Hiſt. 447.

Gunner ſays, in his *Norwegian Flora*, that this plant, and alſo the common lovage, intermixed with ſalt, are adminiſtered to cattle as a preſervative againſt all diſeaſes. " *Folia* " *hujus, vel et liguſtici leviſtici, plantæ hor-* " *tenſis, cum ſali peccoribus ut remedium pre-* " *ſervativum dantur.*" Gunner, Norw. 85.

The moſt modern botaniſt who has mentioned the properties of the *liguſticum* of Scotland, is John Lightfoot, in his *Flora Scotica.* He ſpeaks of it as follows:— " This plant grows on the rocks by the ſea- " ſide in many places, as on the coaſt of " Fife, between North and South Weems, " and below Kinghorn, and frequently in " the weſtern iſlands of Jura, Ilay, Iona, " and Sky; in which laſt it is called by the " name of *ſhunis*, or *ſiunas*, gauliſh; and is " ſometimes eaten raw as a ſallad, or boiled " as greens. The root is reckoned a good

" carminative.

" carminative. An infuſion of the leaves " in whey is given to their calves to purge " them. The doſe is ʒvii." *Lightfoot, Flora Scotica, part II. p.* 205, *tab.* 24.

This is all the information I have been able to collect reſpecting this plant, which the Scotch highlanders, and the inhabitants of the Hebrides, regard as a kind of univerſal panacea. In France, our angelica was formerly held in pretty much the ſame eſtimation; it was extolled above every thing: and it ought to be obſerved, that the *liguſticum* of Scotland is ranked, by Lamark, among the angelicas.

END OF THE FIRST VOLUME.